JOURNAL OF GAS LIGHTING AND WATER SUPPLY

VOL. CXXXVI. No. 2793.] LONDON, NOVEMBER 21, 1916. [68TH YEAR. PRICE 6d.

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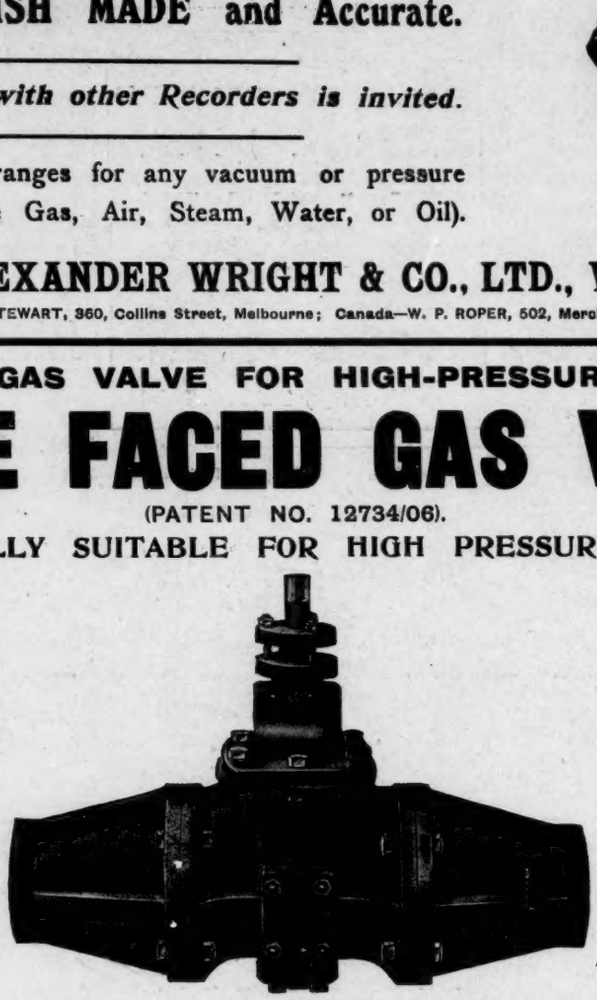

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JOURNAL OF GAS LIGHTING & WATER SUPPLY.

EDITOR & PUBLISHER: WALTER KING. OFFICE: 11, BOLT COURT, FLEET ST., LONDON.

VOL. CXXXVI., No. 2793.] TUESDAY, NOVEMBER 21, 1916. [68TH YEAR.

EDITORIAL NOTES.

The National Gas Council at Work.

ALL the machinery required by the National Gas Council to proceed with work in the interests of the gas industry in its entirety has now been completed and authority conferred; and at the first meeting on Wednesday last (a *précis* of the proceedings at which is given elsewhere), the Council ratified what has been done by the Executive Committee and the General Consultative Committee. The Executive Committee, in consultation with the Solicitors (Messrs. Radcliffes and Hood), have drawn up the constitution and rules of the Council; and the General Consultative Committee have considered and amended them in certain particulars. The Council have adopted them; and in their final form they are published to-day in other columns. As to the constitution, our readers are pretty well acquainted with its general outline; but now they have it all presented formally and in detail in black and white. As to the rules, they have been framed upon broad lines, which give the Council, and the subsidiary but the real operative components scope for action, which will enable them to speak and perform for the whole gas industry and its organizations with all the authority and promptitude the importance and urgency of the case and time may demand. In bringing into existence the power of united forces, the movement has been justified. But those who expect an immediate development from this newly established and representative body to something of even greater magnitude may, looking at the solidity of the foundations (as presented in the constitution and rules) that have been laid for the Council, discharge their minds of any hope of such a proceeding having any proximity among prospective events. There is no sign of it anywhere in the constitution and rules; and they tell us as plainly as they can without words that sufficient for the time is the work thereof, and a Council so constituted is, in the combined opinion of those who have in their wisdom brought it into being, the best medium that can be devised for prosecuting the work. There is this to be said for it, that the Council is not a cumbersome body; and its machinery will enable it to move with a speed more in accord with the notions and needs of the day than has previously been the case with other agencies, Furthermore, it will relieve the various other organizations of much work that, through their constitution, they were not individually qualified to effectively perform for the industry, and leave them to pursue untrammelled the special objects for which they have full qualification.

The constitution and rules do not here call for comment or criticism, though we do not withdraw a single word of what has previously been said in these columns as to the pity of it that there was not the will to find a way for making the Executive Committee complete in its representation. That, however, is a matter for the future and not now. But if ever a change is made, it will necessitate an alteration of the rules, which "must be submitted by the General Consulta-"tive Committee to, and be approved by three-fourths of "the members present and voting at, a general meeting of "the Council." The work of conversion that the Society of British Gas Industries will have before them, when the time comes for them to reconsider their position in this regard, will be one that will require during the intervening time all the tact they can command.

The stated objects of the Council are five; but it will be remarked that, although comprised in few words, they are comprehensive ones. The first is "to promote or [? and] "defend the interests of the gas industry of the United "Kingdom." That "object" stands at the head and front of all the operations of the Council; and if it stood alone, it would present sufficient justification for the establishment of the Council. "To promote or defend the interests of the "gas industry of the United Kingdom!" The words are worthy of contemplation. The industry is an exceedingly large one; its "interests" have a range and ramification to an extent that defies definition within easy compass. And with forces—some friendly, some hostile—always more or less at work in connection with those interests, there should never be any lack of work for the Council in endeavouring to bring the forces into operation to the advantage of the industry, or to do all possible to defend it against such as are, or threaten to be, inimical. Ability, prescience, diplomacy, and activity will all be required in the work, and as time progresses, it is evident, in larger degree than has ever before been called for. Therefore it will be, in view of the constitution of the Council, for the organizations which will supply the elements composing the Council to see that they, with an eye to the responsibility that will be upon their representatives, select the right men for the work; and for the whole industry (which, as such, has never before had a representative body of its own) to back-up the Council in every possible way, for the members of the new body are voluntarily taking upon themselves a no light task.

The second object is to raise and administer funds. This is an important matter. Work of the kind cannot be undertaken without funds; and a scheme of financing has yet to be framed, for, beyond this single mention of funds in the "objects" of the Council, there is no reference in the rules as to the intentions in this regard, although there are in office an Hon. Treasurer and Hon. Auditors, and Trustees are to be appointed who will have power to hold property and invest funds. Moreover, the administrative work of the Council will require money; and the Executive Committee "have power to incur expenditure for the purposes "of the Council not exceeding £200 per annum, and such "further sums as may from time to time be authorized by "the General Consultative Committee." The other objects foreshadow a time when the gas industry will possess premises of its own more worthy of its work, position, and prestige than the offices at present in the occupation of its technical and commercial organizations. Passing on, the constitution of the Council, of the General Consultative Committee, and of the Executive Committee, their meetings and powers in regard to work are set out. It is patent that there is no desire that the operations of the Committees shall be in any wise stultified by a cast-iron formality. Speedy exercise of power, is obviously a paramount essential for the active elements in such a body.

Already operations have been commenced. The Executive Committee have appointed a Special Committee to conduct negotiations with the Board of Trade (Reserved Occupations) Committee respecting the proposed further recruiting of men from the gas industry after the winter. It is announced that a circular on the subject is being issued to the managers of all the principal gas undertakings. The same Special Committee are also dealing with the question of the increasing difficulties which are being experienced by gas undertakings in obtaining supplies of goods and materials necessary to the maintenance of the output of gas. There are various other matters in mind; and suggestions were made at the Southern District Association meeting, which have probably been duly noted for consideration by the Hon. Secretaries of the Council, and which are referred to in another editorial article. We repeat there will be no lack of work falling to the lot of the National Gas Council.

First Order under the New Calorific Power Act.

WE have received for publication the first Order made by the Board of Trade (and signed by Mr. Garnham Roper) under the Standard of Calorific Power Act. It refers to the Sheffield Gas Company's application, of the decision in which a preliminary notice was given in the "JOURNAL" last week. This Order is of immediate value to the gas industry for two reasons. The first is that it divulges the

attitude the Board of Trade are prepared to take in the matter of opposition to a necessary change in respect of the standard quality of gas. The second is that—after the complete discussion of the desire of the Sheffield Corporation to extend parliamentary precedent in the matter of B.Th.U., and to put a narrow time-limit on the Company in respect of a temporary lower standard than the civic authorities wanted—the new Order may, with some confidence, be accepted by the gas industry as disclosing the lines upon which subsequent Orders will be made, unless there are exceptional circumstances which can be well substantiated to justify an alteration in the conditions. The Sheffield Corporation were under the impression that the circumstances of the city in relation to gas supply were exceptional; but the Board of Trade have by their decision tried to disabuse the minds of the Corporation of any such notion so far as the circumstances affect the question of a higher thermal value being put upon the gas than that now obtaining in so many other equally important gas-supply areas. Their non-success in raising the parliamentary standard by 10 per cent., together with the other conditions laid down, will, it is hoped, act as a deterrent to further opposition in subsequent cases; and it will also allay those fears as to the line of action of the Board of Trade which have, it is known, retarded the making of application for Orders on the part of certain undertakings.

The features of the Order are: The application of the standard of 500 B.Th.U. in substitution of the illuminating power one; the raising of the minimum pressure to 15-10ths (registered as near as may be to the junction with the main of the service-pipe supplying the consumer); the provision, if desired within two years, of suitable flat-flame burners in place of existing ones; the prescription of five years as the term within which either the Company or the Corporation may apply for a revision of the standard up or down; and the condition that the testing apparatus shall be such as may be agreed upon between the Corporation and the Company, or, failing agreement, shall be similar to the apparatus from time to time prescribed by the Metropolitan Gas Referees. There is nothing more to be said regarding the standard of 500 B.Th.U. gross. Then, as remarked upon previous occasions, no gas supplier, in view of the uses to which his commodity is now put, can object to a minimum pressure of 15-10ths. There is nothing new as to the provision of flat-flame burners. No valid objection can be raised as to the power to make a quinquennial application for a revision of the standard. Power of application does not mean that it will be exercised, or that there will necessarily be revision. The calorific standard of 500 B.Th.U. has already become well established in many places, representing a not inconsiderable proportion of the gas sales of the country; and it is quite possible that, by the time the period arrives when application for a revision may take place, no one will be able to find sufficient reason for doing so, unless it be the Company for a lower standard, in order to produce (as developments may suggest) a grade of gaseous fuel on terms more economical to the consumers. No one can tell. But we do not view the quinquennial power of making application for revision with any apprehension or misgiving. It affords certain immunity from change for five years (a shorter period would have been unjust); and experience as to the adequacy and suitability of a standard of 500 B.Th.U., assuming conditions remain as now, will be much hardened five years hence.

As to the calorific-testing apparatus to be employed, the Board refuse to be made arbiters in the matter, in the event of disagreement. What the Order in effect says is: "If "you can agree as to the type of apparatus to be employed "for testing, well and good; you may have that particular "apparatus. If you cannot agree, then you must adopt the "one prescribed by the Metropolitan Gas Referees." There is an objection to being bound, without power of appeal, to the prescription of the Gas Referees, as was shown in the "JOURNAL" for Oct. 17 (p. 118); and there is an advantage in having liberty to agree, if agreement be possible, to any improvement that may be made which will give to the gas its rightful due in total heat value. But there are some local authorities who will never agree to anything that would credit the gas of a company with any additional benefit, however just; and that is why the absence from the Order of power to appeal in the event of disagreement over the apparatus to be employed is a disadvantage.

However, we congratulate the Sheffield Company on their success in the case they presented against the opposition of the Corporation. It is a pity the Corporation did not, at the outset, view the matter in a broader spirit; but probably other local authorities would have been dissatisfied if there had not been a fight of some sort. As it is, probably some of them will still consider, notwithstanding all the inquiry that has been made in Parliament and by the Board of Trade, they could do something to persuade the Board that they and Parliament before them have made an egregious blunder in fixing 500 B.Th.U. as the standard. That is the standard settled long before benzol and toluol were wanted for the war; settled, too, before a desire arose to make this country independent of Germany in respect of dyes and other things for which benzol and other coal products are essential. However, it may be taken for granted that the Board of Trade have definitely determined the lines they are prepared to take, and these lines are presented in the Sheffield Company's Order.

Oil Washing for Benzol Extraction—Government and Gas Undertakings.

"THERE is no greater or more important work to be done "than the production of benzol and toluol. . . . More "and still more benzol and toluol are required." These words are found in the introduction by the President (Mr. W. Doig Gibb) to a discussion that took place last Thursday at the meeting of the Southern District Association of Gas Engineers; and Mr. Doig Gibb, from his connection with the Supply of Explosives Department of the Ministry of Munitions, knows the strength of the foundation for such assertions. This Southern discussion possesses some rather exceptional features, which concern not only those who, with robust patriotism, are doing all they can to help the country by oil-washing their gas, but those who, with a miserable and pitiable disinclination, are not doing anything to serve the country, and those who are making a bare show at doing something, but that something about the minimum. The second and third of these classes are those who are apt at excuses. These excuses were dealt with during the discussion, and in a manner by certain of the speakers that will not be at all palatable to some of those who allow selfishness to be supreme to all else. And among those who are sensitive of criticism, there will perhaps be stimulated a sense of shame which will stir them to action. The plain truth of the matter is, as Mr. James Paterson put it in other words, National safety must override everything; and the sooner this is recognized by those responsible for gas undertakings where in this matter laxity reigns, the better for them, for the nation, for the war, and consequently for the saving of life and blood on the battle fronts. What is to be said of those people who, claiming to be human, can harden their hearts to all this, and yet keep their eyes open wide enough to visualize local difficulties with an extravagance that the related experiences of Mr. Thomas Glover and Mr. P. G. Moon, at Norwich and Bournemouth respectively, show need not exist? Even if they did, Necessity claims with an imperative voice.

Naphthalene and other troubles are spoken of. But as to naphthalene, it is true that though oil-washing—temperature conditions of gas and oil having proper relation to each other—will reduce the naphthalene content of the gas, at the same time the solvents—the heavy naphtha vapours—are reduced in greater proportion. In such circumstances, trouble may be expected, if there is not legislation against it on the part of those introducing oil-washing. Why are some undertakings troubled and others not with naphthalene when adopting oil-washing? The President, Dr. Colman, and those gas engineers who are serving the country without any sense of worry, all tell us that compensation, either by oil-spraying or vaporizing, has to be made for the heavy naphtha vapours that are removed from the gas, and rather in excess of the quantity; and that this compensation must be made coincidently with the introduction of the oil-washing, and not be left until the naphthalene trouble has accumulated. It is a case of "prevention being better than "cure;" for in this matter the "cure" is a long job, with a great deal of discomfort for gas consumers and suppliers. This means that the introduction of oil-washing should be, at the same time, accompanied by oil-spraying or vaporizing for compensating the gas for any deficiency of naphthalene carriers. Some prefer one method, some the other. As to the other difficulties, the introductions to the discussion, as well as the discussion itself—especially the working hints supplied, through the President, by Mr. Whitehead, of the

Explosives Department—provide much valuable suggestion that will contribute considerably to the efficiency of the oil-washing system.

The difficulties are therefore subject to negotiation, and so have no legitimate standing in the face of the claims for benzol and toluol on the highest of all grounds, which grounds are being ignored by a number of undertakings. Those who are oil-washing or are making preparations to do so, feel very acutely that those who are not, and yet are in the position to do so, should not be allowed to persist in their attitude, to the detriment of country, and certainly not in fairness to those who of their own volition took upon themselves the duty, which it is not too much to say is a righteous one. Those gas engineers and administrators, however, who are resisting oil-washing will read, with some misgivings as to the security of their particular position in this matter, that there are gas engineers who are actually suggesting to the Government the application of compulsory oil-washing; and, although Mr. Doig Gibb shows a certain inclination of personal view, but a caution in avoiding any expression of opinion that may be taken to be the probable official one in this connection, it would not be surprising, after the feeling in favour of compulsion that was expressed (not formally but it was there) at the Southern meeting, if the Government considered the matter in view of the requirement for larger supplies of benzol and toluol. There is no telling. If so, those who were compelled to come into line by command would no doubt bitterly feel the littleness of their position in contrast with those who voluntarily responded not only to the appeal of the Government but to the silent appeal of those who have laid down their lives in the cause for which we are fighting. The provision of adequate supplies of benzol and toluol is a small thing compared with the laying down of one's life for honour and for country. And numbers of even small works can help; some are already voluntarily doing so through oil-washing. They are "doing their best bit;" and yet they are works (Mr. Carr cited the names of some) of only 10, 20, 43, and 81 million cubic feet output per annum. These small works cry shame on the larger ones that are still inclined to hold back.

There is, however, another side to the picture; but we cannot admit that it has any effect upon the question of whether or not oil-washing should be practised. Necessity and all else to which we have referred do not give any choice, where circumstances admit. But it is felt, and very strongly, in the gas industry that there is insufficient reciprocity in this matter on the part of the Government. There is no adequate protection from their side. "Benzol, and "toluol," they say, "we must have. Benzol and toluol you "can give us. To enable you to do so, we will give you an "opportunity of applying for a calorific power standard, as "you will not be able to oil-wash your gas and comply with "your illuminating power standard." So far so good. But Mr. W. E. Price, Mr. T. N. Ritson, Mr. D. H. Helps, and some others point out that there the Government stop short. In order to obtain the change of standard necessary to the supply of maximum extraction of benzol and toluol, the gas undertakings are exposed to opposition as in the Sheffield and Cheltenham cases; and this on the part of non-gas-supplying local authorities, while equally important authorities are making application for exactly the same powers for their gas undertakings. This shows the absurdity of the position. When opposition is offered—as in the Sheffield case—Counsel and witnesses have to be retained, and expenses are thus piled up. This shows the anomalous position in which the inaction of the Government in not preventing such opposition places the gas undertakings. The Government requires; the gas undertakings are left by the Government to fight out the matter with the local authorities, while the precedent already created by the two Houses ought to control without the necessity for any further contest. Now, however, that the Sheffield case has been adjudicated upon, the Government ought, through the Board of Trade, to put an end once and for all to a condition of things in respect to these applications that is acting as a deterrent, especially in the case of the small and medium-sized gas undertakings which have no money in these times with which to conduct a fight with the rate-backed local authority. There is no question the Sheffield decision will now dominate others; but in order to make this clear, is a fight to be allowed to precede the announcement of similar decisions?

Talking of protection against opposition reminds one of after-war conditions. The plant that has been put down for war purposes will be useful for the production of dye materials and motor spirit. Are not the Government going to do anything to protect the gas and coke-oven industries after the war, and so help to make the country the stronger by putting it in a position to become, to the extent of its capacity, independent of outside sources for motor spirit and dye materials? In assisting the dye-producing industry, the Government have only done half their work; they must, if there is to be permanent security, protect both the dye industry and the producers of the raw material upon which it must rely. The same with motor spirit. Are the gas and the coke-oven industries to face the competition of imported petrol, and the strong financial interests at its back, without the aid of the Government? These are questions that, in the national interests as well as in those of the two industries, should be brought prominently before the Government. And all these matters—compulsory oil-washing, the prevention of further waste over opposition to the applications for the calorific standard, and protection after the war—are of a kind which the National Gas Council might take up, and the sooner the better.

Calorific Power in America.

PRACTICALLY throughout the United States, the question of the substitution of calorific value for illuminating power as the standard of quality for gas is either under consideration or else has actually been instituted. As between State and State, there are considerable differences; but, taken on the whole, there is now a decided tendency to prescribe lower values than those that were first talked about or contemplated by the controlling Commissioners. Perhaps the most interesting piece of work that is being carried out in this connection is in the State of Massachusetts, where, under an Act investing them with the necessary powers, the Board of Gas and Electric Light Commissioners are having an investigation made at works the managers of which are this half year operating their plants without any regard to the illuminating power of the gas, but with such heat value as they consider will give consumers the greatest amount in view of the several uses to which gas is being put. The Commissioners in this case are therefore not proposing to adopt in any haphazard manner a numerical standard for the thermal value of the gas, but are seeking to obtain some guidance in the matter. This cannot be said of the prescriptions of certain other States. For some of them there appears to be little reason. An announcement, for example, has now been made as to the establishment, by the New York State Public Service Commissioners (Second District), of a calorific standard for the territory under their jurisdiction; but we are at a loss to understand how they have arrived at the standard fixed upon.

There is also a certain amount of novelty about the conditions. The standard is put at 585 B.Th.U. (we assume this is total heat value); and this is to be the minimum monthly average. The 585 B.Th.U. appears to be an odd figure to adopt as a standard; and not only an odd one but a figure without rhyme or reason, unless it is the actual average found by experiment over a month. But though the minimum monthly average is to be the figure mentioned, it is further enacted that the gas shall not for any three consecutive days in each month average more than 5 per cent. below 585 B.Th.U. This being so, the minimum over three days may be about 555 B.Th.U., although the monthly average is to be 585 B.Th.U. Then the tests are to be made within two miles radius of the manufacturing plant, which is really another superfluous provision, as the test for calorific value might just as well be made at the works as anywhere else. Another provision is that the average daily heating power of the gas furnished during the preceding calendar month is to be posted in the principal office of the undertaking concerned, "in order that the "customers and the public may be advised of the quality of "the gas being supplied." It is difficult to understand how the public will be advised as to the quality of the gas being supplied by the figures referring to the quality delivered during the preceding calendar month. In all the circumstances, this also appears to be a superfluous condition. Certain it is that no one is likely to accept the prescription as a model one for adoption; and if, as seems likely, a similar step is shortly taken for the First District of New York State, it is to be hoped that a standard having a more finished appearance about it, and free from excess, will be the result.

Certified Occupation Revision.

Attention may be drawn to the fact that a revised list of certified occupations has been issued, containing numerous variations from those that have already appeared. The principal change made with the object of releasing men for military service (though certain occupations included in former lists have now been removed) is a general raising of the ages. Doubtless the list will be carefully studied by employers and employed, and particular note will be taken of the statement that the reservations contained in this list will be again reduced early in 1917 by a further raising of the age limits, especially in the trades not mainly engaged on Government work. Employers in certified trades should, it is added, therefore take such steps as are practicable to re-organize their staffs, by substitution or dilution, with a view to being prepared to release more men of military age and fitness for the army. Along with the list, the Local Government Board are circulating copies of pamphlets with regard to the employment of women—a matter which the Tribunals are urged to keep in mind. Under the heading of Public and Public Utility Services, all classes of workmen inside gas-works are still included in the list, irrespective of age; but in the case of workmen engaged in the provision and distribution of water, the age at which reservation begins has been raised to 41 for single men, and been fixed at 25 for married men.

Property and Trade Protection.

With so many other things urgently demanding careful consideration just at present, it is to be feared there is much likelihood of a call to action by the Liberty and Property Defence League not receiving the amount of attention which it may deserve, and which doubtless in other circumstances it would get. However, if it can be done, now is really the time to form definite plans for the future. Enough, surely, has been seen of late of the effects of delay in various directions. The suggestion which the League put forward has relation to a scheme of organization for the protection of property and trade after the war; and for the need of this a strong case is made out, based on the state of affairs which existed before it. Who does not remember how much of the heavy burden of taxation and rates imposed upon the property-owning and trading classes was put down to the fact that taxpayers and ratepayers were insufficiently organized? And who will deny the truth of the assertion that the remedy for over-government and the waste of public money on unnecessary and worthless objects lies with those who pay? The League (whose offices are at No. 25, Victoria Street, Westminster) have what appears to be a workable scheme for securing better organization of the classes they are concerned with, so that after the war an effort may be made to place the whole system of public expenditure "upon a strictly business and rigorously economical basis."

Industrial Methods after the War.

At the same time, there is before us a memorandum of matters relating to the future of industry and the interests of employers, issued by the Employers' Parliamentary Council, who state that they have watched the development of events in the industrial world since the outbreak of war with feelings of hope and confidence as to what the future has in store. Looking to the after-the-war period, agreement is expressed with a published statement of Lord Lamington, that the first thing to be done to ensure a wise industrial policy is to repeal the Trade Disputes Act. This the Council say is one of the first questions that will have to be raised by them when the time for resuming their normal activities arrives, as there can be no freedom and security for industry until all combinations of capital and labour are subjected to the ordinary law of the land, and conspiracies for "paralyzing the country" by means of general strikes or lock-outs rigorously suppressed. It is essential that labour should be free to produce all it can. High wages, by all means; but, as the Council point out, they must be earned. Something also is said in the memorandum upon freedom for private enterprise; the need being emphasized of keeping a close watch so as to prevent Parliament sanctioning any measures which aim at displacing private trade and enterprise, and establishing Municipal Works Departments all over the country. Finally, reference is made to the appointment as Labour Adviser to the Government of Mr. Arthur Henderson; and the hope is expressed that the new Department may not be permanent.

Coal and Coke Exports and Values.

The quantity of coal exported during October was 3,497,781 tons, as compared with 6,739,473 tons in October, 1913, which, of course, was undisturbed by war. In October, 1914, the quantity exported was 3,944,497 tons; so that last month shows a decline on that figure of 446,716 tons. In October, 1915, the quantity exported was 3,530,546 tons; so that the shipment last month was reduced by 32,765 tons. From Governmental quarters, since there has been close departmental touch with the Coal and Coke Supplies Committees (which are reputed to be largely dominated by coalowners), there has been a frequent cry as to the need of economizing in this country, so as to release more coal for abroad in order that an increased revenue for coal may be realized from allied and neutral countries. The tremendous drop in exports has been lamented; but largely the drop has been due to causes both essential and unavoidable—such as the closing of trade with enemy countries, the necessity of regulating shipments so that our coal may not be sent *vid* neutral countries to enemy ones, or used in the former for the benefit of the latter, the shortage of ships, and the requirements at home. But the lamentation has not been accompanied by any mention of the remarkable increase in the value of the coal exported. Though last month the quantity shipped was lower by 3,241,692 tons than in October, 1913, the value is returned at £4,517,045, or only £148,200 less than the value returned for nearly double the exported quantity in October, 1913. In such circumstances there is not much of which to complain. The value of the coal exported in October, 1914, was £1,918,337 less than that for last month, and the value of that exported in October, 1915, was £1,390,788 less than that of last month. These figures show what a wonderful augmentation of values of the coal sold for abroad there has been since the war started, and especially during the past twelve months. The figures for coke exports are: 1913, 150,955 tons (value, £135,168); 1914, 150,879 tons (value, £107,629); 1915, 113,499 tons (value, £149,333); and 1916, 113,901 tons (value, £214,147).

PERSONAL.

At the Mark Masons' Hall on the 13th inst., W.Bro. J. W. Broadhead, of Elland, had the honour of being invested by the Earl of Cork as Grand Junior Deacon of the Grand Council of Allied Degrees of England, &c.

On the occasion of his recent marriage, Mr. William E. Harris, Outdoor Superintendent to the Swindon United Gas Company, was presented by the officials, office staff, and outdoor workmen with a marble drawing-room clock.

Mr. H. P. Maybury, of the Road Board, an Honorary Member of the Institution of Gas Engineers, and formerly County Surveyor of Kent, has been given command of the newly-formed road-making battalions for France, with the rank of Brigadier-General.

The name of Mr. G. S. Frith, Secretary and Engineer of the Runcorn Gas Company, and Hon. Secretary of the Manchester District Institution of Gas Engineers, has been added to the Commission of Peace for the County of Cheshire. For a considerable time, Mr. Frith was Secretary and Engineer to the Frodsham Gas Company; and he took up his present position four-and-a-half years ago.

Mr. W. G. Head, Mains Superintendent of the South Metropolitan Gas Company, has resigned his position as District Manager to the Metropolitan Munitions Committee, and is now engaged at the headquarters of the Munitions Inventions Department of the Ministry of Munitions, assisting Mr. A. M. Duckham, the Deputy Comptroller, whose work for the department is of the utmost importance.

Second-Lieut. R. F. Irving, formerly an Assistant at Bournemouth, and son of Mr. D. Irving, Chief Engineer of the Bristol Gas Company, is now carrying-out some important experiments for the Munitions Inventions Department. He was for some time at the front in France, and there got gassed, and was invalided home. His general experience in France is of considerable value in the work upon which he is now engaged.

Mr. H. J. Carpenter, of Harrow, has been appointed Assistant Engineer and Manager to the Doncaster Corporation Gas Department. Mr. Carpenter is the son of Mr. S. Carpenter, of Cromer, formerly of Dorking. He received his engineering training with Messrs. S. Cutler and Sons, with whom he was a pupil for four years, after which he stayed for a time as draughtsman. He then went to Messrs. Corbet Woodall and Son, whom he left to take up the position of Engineering and Works Assistant to the Harrow and Stanmore Gas Company, which position he has occupied for twelve years. Mr. Carpenter holds certificates in "Gas Manufacture and Distribution" (first-class honours), and other subjects.

THE NATIONAL GAS COUNCIL OF GREAT BRITAIN AND IRELAND.

THE First Meeting of the National Gas Council was held at the Caxton Hall, Westminster, on Wednesday last, Nov. 15, at 4.15 p.m. There were present :—

The President—Mr. H. E. JONES.

Mr. J. W. Auchterlonie.	Mr. William Hardie.
Mr. J. H. Balfour Browne, [K.C.	Mr. T. H. Hazell.
Sir Joseph Bellamy.	Mr. H. C. Head.
Mr. Thomas Berridge.	Mr. D. H. Helps.
Mr. R. W. C. Beynon.	Mr. A. A. Johnston.
Mr. John Bilbie.	Alderman Wm. Kay.
Mr. T. A. Braddock.	Mr. W. M'Dowall.
Mr. J. W. Broadhead.	Mr. Archibald P. Main.
Mr. G. Clarry.	Mr. R. J. Milbourne.
Mr. S. Cutler, jun.	Alderman F. S. Phillips.
Mr. Cyril G. Davis.	Mr. W. E. Price.
Mr. R. W. Edwards.	Sir Hallewell Rogers.
Mr. W. B. Farquhar.	Mr. W. J. Sandeman.
Sir Fortescue Flannery, Bart., M.P.	Mr. R. G. Shadbolt.
	Mr. S. Y. Shoubridge.
Mr. John Foster.	Col. Arthur Smithells.
Mr. W. Doig Gibb.	Mr. H. M. Thornton.
Mr. Samuel Glover.	Mr. F. C. Tilley.
Mr. Thomas Glover.	Mr. Edwin Upton.
Sir Daniel F. Goddard, P.C., M.P.	Mr. Thomas Waddom.
	Mr. D. Milne Watson.
Mr. F. W. Goodenough.	Mr. W. N. Westlake.
Mr. Thomas Goulden.	Mr. Charles Wood.
Mr. B. R. Green.	Mr. H. James Yates.
Mr. Thomas Hardie.	Mr. John Young.

Apologies for absence were received from: Mr. John C. Belton, Mr. John Bond, Mr. A. E. Broadberry, Mr. Charles Carpenter, D.Sc., Mr. Charles Clare, Mr. George Clark, Mr. Dugald Clerk, D.Sc., Mr. Albert Cliff, Bailie J. C. Drummond, Lord Provost of Edinburgh, Mr C. A. Goodall, Alderman W. H. Goodyear, Mr. W. D. Helps, Mr. Percy F. Holmes, Mr. J. R. H. Jacobs, Mr. H. Kendrick, Mr. Alex. Masterton, Mr. Hubert Pooley, Alderman W. B. Redfern, Mr. Robert Watson, Mr. Chas. H. Webb, Mr. W. Whatmough, Mr. Alex. Wilson, Mr. W. Woodward.

On the motion of Sir HALLEWELL ROGERS, Mr. D. Milne Watson took the chair in the absence of Mr. H. E. Jones.

The report appearing in the issue of the "JOURNAL" of the 10th of October of the conference on the 3rd of October, at which the Council was constituted, was adopted as the minutes thereof and taken as read.

Mr. W. E. PRICE, one of the Joint Honorary Secretaries, then read the report from the General Consultative Committee, as follows :

REPORT OF THE GENERAL CONSULTATIVE COMMITTEE TO BE PRESENTED TO THE COUNCIL AT ITS FIRST MEETING ON WEDNESDAY, THE 15TH OF NOVEMBER, 1916.

1. The Committee have approved the constitution and rules drawn up by the Executive Committee in consultation with the Solicitors (Messrs. Radcliffes and Hood), as amended by the General Consultative Committee, and submit them herewith for the approval of the Council.

2. Acting in accordance with the instruction of the conference of the 3rd of October last, "to put into operation a working scheme," the Committee have proceeded to the election of the following officers for one year—namely :

As President :	Mr. H. E. Jones.
As Vice-Presidents :	The Presidents for the time being of the four constituent bodies.
As Chairman of the General Consultative Committee :	Alderman F. S. Phillips.
As Vice-Chairman of General Consultative Committee :	The Chairman of the Executive Committee.
As Deputy-Chairman of General Consultative Committee :	Mr. H. M. Thornton.
As Chairman of the Executive Committee :	Mr. D. Milne Watson.
As Honorary Treasurer :	Alderman W. Kay.
As Honorary Auditors :	Messrs. E. L. Burton and Charles Clare.
As Honorary Secretaries :	Messrs. W. E. Price and F. W. Goodenough.
As Secretary :	Mr. W. J. Smith.

3. The Committee have gratefully accepted the use of the offices of the Institution of Gas Engineers, No. 39, Victoria Street, as temporary offices of the Council. It is hoped in the course of next year to obtain suitable offices in one building for the Council, the Institution of Gas Engineers, and the British Commercial Gas Association.

4. The Executive Committee have appointed a Special Committee to conduct negotiations with the Board of Trade (Reserved Occupations) Committee respecting the proposed further recruiting of men from the gas industry after the winter. A circular on the subject is being issued to managers of all the principal gas undertakings.

5. The same Special Committee is also dealing with the question of the increasing difficulties which are being experienced by gas undertakings in obtaining supplies of goods and materials essential to the maintenance of the output of gas.

(Signed F. S. PHILLIPS, Chairman.
D. MILNE WATSON, Vice-Chairman.

At this juncture,

The PRESIDENT having arrived (after being delayed on the railway) took the chair, and said that in doing so at the Council for the first time he should like to express indebtedness to every branch of the united body. He felt himself officer and servant of each branch, and trusted that he should discharge his duty without fear, favour, or prejudice to anyone or any interest. He congratulated the union of the four bodies in this great service. The gas industry was a very important one, and no doubt all would gather strength from the union. They had been called upon to lose a great many men, and to furnish supplies and materials which were comparatively new to them. It was certain all were doing, and would do, their best in this national emergency. The rank and file had behaved nobly, and many of their names were now included in the Roll of Honour. They had gone forth earnestly and sincerely, and had done their duty manfully and patriotically, and their names and memories would be cherished by all. He hoped, as the Council progressed, to have better and still better reports by which to justify the existence of this important Association.

Sir HALLEWELL ROGERS then moved the adoption of the report. He hoped that the members who were not present would understand that the matter had been put on broad lines, and that the report would commend itself to the members of all branches.

Mr. R. W. EDWARDS (Aldershot Gas and Water Company) seconded the motion.

It was suggested by the Chairman that the rules should be taken as read. Carried *nem. con.*

The motion that the report be adopted was then carried unanimously.

Mr. D. MILNE WATSON moved a hearty vote of thanks to Mr. Jones for presiding at the first meeting of the newly constituted National Gas Council, and thought that it augured well for the future of the Council that Mr. Jones found himself supported by such gentlemen as Sir Joseph Bellamy, Sir Fortescue Flannery, the Right Hon. Sir Daniel Goddard, Sir Hallewell Rogers, Mr. J. H. Balfour Browne, K.C., and many other gentlemen, who had come to support the movement. He believed there was a great future for the National Gas Council.

Sir FORTESCUE FLANNERY said he had great pleasure in seconding the motion. There had no doubt been a lack of concentration among the various branches of the industry, and he reminded them once more that "Union is Strength." He looked forward with the utmost confidence to the success of the united body who represented these great interests.

The motion was carried unanimously.

Mr. H. E. JONES said he had no small sense of his own personal insufficiency in the presence of gentlemen who had paid so much attention to this question. He did not know why they had placed him in this position—perhaps because of his forty-five years' serious and strenuous work in all the grades of the business.

The meeting then terminated.

[*** The full text of the "Constitution and Rules of the National Gas Council of Great Britain and Ireland" appears on pp. 405-7 of to-day's issue of the "JOURNAL."]

CALORIFIC STANDARD ACT APPLICATIONS.

Eleventh Official List.

THE Board of Trade notify the receipt of the following applications for Orders fixing a calorific standard of 500 B.Th.U.

EAST GRINSTEAD GAS AND WATER COMPANY.
HASTINGS AND ST. LEONARDS GAS COMPANY.
TORQUAY GAS COMPANY.
TUNBRIDGE WELLS GAS COMPANY.

There will be a meeting of the Midland Section of the Coke-Oven Managers' Association at the Sheffield University next Saturday. Mr. J. A. Wilson, of Staveley, will read a paper entitled "Points on the Recovery of Benzol."

Mr. John Dempster, of Keele Hall, Newcastle-under-Lyme, of the firm of R. & J. Dempster, Limited, Newton Heath, Manchester, who died last June, left real and personal estate of the gross value of £432,448 ; the net personalty being £407,059.

The Cambridge University correspondents of the "Manchester Guardian" state that the Vice-Chancellor's certificate has been awarded to Mr. Alfred Cobham, of Southport, who had undertaken six terms' work in Science and two in Arts, for an essay on "Coal Gas and its Immediate Bye-Products."

SHEFFIELD GAS (STANDARD OF CALORIFIC POWER) ORDER, 1916.

Text of the First Order Made under the New Act.

THE following is a copy of the first Order made by the Board of Trade under the Gas (Standard of Calorific Power) Act, 1916, and relates to the Sheffield Gas Company's application.

Whereas the Sheffield United Gaslight Company have made application to the Board of Trade for an Order under the Gas (Standard of Calorific Power) Act, 1916. Now, therefore, the Board of Trade, by virtue and in exercise of their powers under the said Act, hereby order as follows:

1. This Order may be cited as the Sheffield Gas (Standard of Calorific Power) Order, 1916.

2. The provisions of this Order shall apply to the Sheffield United Gaslight Company (hereinafter referred to as the "Company"), in substitution for the provisions as to

(*a*) A prescribed standard of illuminating power;

(*b*) Penalties in respect of a deficiency in illuminating power; and

(*c*) Testing for illuminating power

contained in sections 12, 32, and 36 and in Schedule A of the Gas-Works Clauses Act, 1871, in section 91 (Power to Enter Gas-Works to Examine Quality of Gas) of the Sheffield Gas Act, 1855, section 21 (Experimental Meters to be Provided in Certain Places) of the Sheffield Gas Act, 1866, and section 5 (Quality of Gas) of the Sheffield Gas Order, 1910, and in any other enactment relating to or affecting the Company.

3. (1) In their application to the Company sections 28, 29, 30, and 33 of the Gas-Works Clauses Act, 1871, shall be construed as if the words "calorific power" were substituted therein for the words "illuminating power," and as if the provisions of this Order with reference to the apparatus for testing the calorific power of gas were substituted for the regulations referred to in section 28, so far as they relate to testing for illuminating power.

(2) Section 7 of the Sheffield Gas Order, 1910, shall be construed as if the words "calorific power" were substituted therein for the words "illuminating power."

4. (1) Within three months after the date of this Order, or such further time as the Board of Trade may allow, the Company shall provide at the testing-places prescribed by section 21 of the Sheffield Gas Act, 1866, apparatus for testing the calorific power of the gas supplied by them.

(2) The apparatus shall be such as may be agreed upon between the Company and the Sheffield Corporation, and shall be used in the mode and under the conditions set forth in the agreement. Failing such agreement, it shall be similar to the apparatus from time to time prescribed by the Metropolitan Gas Referees for testing the calorific power of the gas supplied by the companies referred to in the London Gas Act, 1905, and shall be used in the mode and under the conditions for the time being prescribed by the Metropolitan Gas Referees.

5. As from the date of this Order the gas supplied by the Company shall be of a calorific power of not less than 500 British thermal units when tested in accordance with the provisions of this Order; and in the interpretation of this Order the expression "standard calorific power" shall mean 500 British thermal units, and the expression "calorific power" shall mean gross calorific power per cubic foot of gas.

6. Not more than one testing for calorific power shall be made on any one day. Provided that, if on any occasion of testing the calorific power of the gas is found to be below the standard calorific power, a second testing shall be made on the same day after an interval of not less than one hour, and the average of the two testings shall be deemed to be the calorific power of the gas on that day.

7. If on any such testing the calorific power of the gas supplied by the Company is found to be below the standard calorific power they shall be liable to the following penalties (that is to say):

If the deficiency does not exceed 14 British thermal units, £2;

If the deficiency exceeds 14 but does not exceed 28 British thermal units, a sum not exceeding £5;

If the deficiency exceeds 28 British thermal units, then for each complete 28 British thermal units of defective power, a sum not exceeding £10.

8. This order is made by the Board of Trade subject to the following conditions in pursuance of their powers under section 1 (1) of the Gas (Standard of Calorific Power) Act:

(*a*) All gas supplied by the Company to any consumer of gas shall be supplied at such pressure as to balance a column of water not less than 15-10ths of an inch in height at the main, or as near as may be to the junction therewith of the service pipe supplying the consumer; and this pressure shall be deemed to be the prescribed pressure for the purposes of section 36 of the Gas-Works Clauses Act, 1871. Any gas examiner appointed under the Gas-Works Clauses Act, 1871, may for the purposes of this Order subject to the terms of his appointment at the prescribed testing places or at any public lamp, as and when he thinks fit, test the pressure at which the gas is supplied. The Company shall afford to the examiner all reasonable facilities for making the test.

(*b*) The Company, if and when required at any time within two years after the date of this Order by any consumer of gas supplied by the Company, shall supply to such consumer and fix free of charge flat-flame burners suitable in all respects for the consumption of gas of the standard calorific power prescribed by this Order, in substitution for any burners (not being incandescent burners) in use by the consumer before the date of this Order. Notice of this condition shall be given on each demand note of the Company during the period of two years hereinbefore mentioned.

(*c*) If within one month after the expiration of five years from the date of this Order, or after the expiration of any subsequent period of five years, the Company or the Sheffield Corporation apply to the Board of Trade to reduce or increase the standard calorific power, the Board of Trade, after hearing the parties and any other persons who appear to them to be interested, may make such reduction or increase of the standard calorific power as they think fit.

Dated this 16th day of November, 1916.

(Signed) GARNHAM ROPER,
Assistant Secretary to the Board of Trade.

OBITUARY.

The death is announced, as having occurred last Saturday week, after a short illness, of the daughter (only child) of Mr. WILFRID WASTELL, the Secretary of the South Suburban Gas Company.

The death took place on the 10th inst., following an operation, of Mr. WILLIAM H. BALE, of Messrs. Bale and Hardy, Victoria Street, S.W. Deceased, who was in his seventy-third year, was a prominent Mason.

Second-Lieutenant THEODORE A. IONIDES, Oxford and Bucks L.I., who died of wounds received in action on the 16th inst., aged 19 years, was the only son of Mr. and Mrs. A. C. Ionides, of Porchester Terrace, W. He was educated at Radley.

It was announced in the "JOURNAL" some weeks ago that Mr. WILLIAM GRIFFIN, the General Manager and Secretary of the Folkestone Gas Company, had had news that his only son CLIVE had been severely wounded in action. His injuries have unhappily since proved fatal—thus ending a career with the forces which had brought him the distinction of the Military Cross.

A resolution was passed at a meeting of the Manchester Corporation Gas Committee, on the 10th inst., expressing the deep regret of the members at the death of Mr. J. G. NEWBIGGING, and recording their high appreciation of his character and ability, and of "the invaluable services he has rendered to the city during the past sixteen years as Chief Engineer of the Manchester Corporation gas undertaking." The Committee, the resolution added, desired to convey to Mrs. Newbigging and the family heartfelt sympathy in their bereavement.

The sad news has been received of the death, in the far north-west of Canada, of Mr. JAMES BAXTER KEITH, second son of Mr. James Keith, Principal of the James Keith and Blackman Company Limited. Mr. Keith, whose ability, enthusiasm, and kindly manner are remembered by very many friends in this country, was in early years engaged in his father's business, and afterwards became Secretary of the Water-Motor Company, Limited, who originally introduced the "Keith" high-pressure gas lighting (the particular creation of his elder brother George). This Company, after the amalgamation of Mr. James Keith's engineering business with that of the Blackman Company, Limited, under the title of the James Keith and Blackman Company, Limited, was merged into the latter Company, with young Mr. Keith as a member of the staff. Along with his two brothers, deceased served for a number of years with the London Scottish Volunteers, and it was while he was engaged in 1903 with this regiment as a sergeant that he contracted a severe chill which brought about the first symptoms of an illness that made it necessary for him to go abroad and try to regain his health and strength. In 1906, he went to Canada; ultimately acquiring a horse ranch about 25 miles west of Calgary (Alberta). Every few years he paid visits home and renewed acquaintance with old friends; and had his health permitted, he would certainly have been one of the first to volunteer for service at the front with his old comrades—as his younger brother Alexander did. Mr. Keith had not quite completed his thirty-ninth year when he died, after about a fortnight's illness. In Canada, as in this country, there are many who, by his untimely death, have lost a greatly cherished friend.

JOHN GIBSON NEWBIGGING—AN APPRECIATION.

By EDWARD A. HARMAN, M.Inst.C.E.

THE removal by death of the master minds of the gas profession cannot be lightly regarded at the present moment in the history of the empire. There is a real danger of their memories being overlooked in the pressure of urgent matters of to-day. In all justice, this should be prevented.

The latest important loss is the passing of John Gibson Newbigging, of brilliant parts and passion. He had both abundantly. Of the former, no one who has realized the splendour of his work

will for a moment question; but of the latter—viz., his passion for work—only those nearest to him could be fully aware. The stress told all too soon upon his splendid constitution.

A month or so since (Oct. 6), he attended, at great inconvenience, the Council meeting of the Manchester District Institution of Gas Engineers, and gave his enthusiastic support to the several proposals before the meeting. One thing—the thing of the moment—was that all the members should be urged to attend the Wombwell meeting to inspect the benzol processes, the importance of which he considered of grave importance. Although he had previously had the opportunity of inspecting the plants, he promised faithfully to attend if he could, if only as an incentive to others, although as he stated he could ill-afford the time involved. But this resolve, to his great regret, was prevented. In regard to the nomination of new members for the Council, it was customary that only three names should be submitted; but, as seven names were proposed, he insisted upon the members having all submitted to them, which was accordingly done. It was realized there would be a natural disappointment to the candidates who were not successful; but Mr. Newbigging strongly urged that they would look at it in the right light, while they would probably secure election the following year.

His own personal interest and devotion to the Manchester District Institution of Gas Engineers were very great. He had a broad mind, and would willingly have enlarged the boundary of the Institution if he could have had his own way. Indeed, he was convinced that this enlargement would eventually take place. The paralysis and the subordinate position of so-called professional societies did not appeal to him. His last nomination for membership was that of his esteemed and respected colleague, Mr. Frederick A. Price, the Superintendant of the Manchester Corporation Gas Department, whom he wisely recognized would be a most valuable addition and an honour to the roll of membership. Needless to say, the election of Mr. Price was heartily welcomed and carried unanimously.

At the Wombwell meeting before-mentioned, something like consternation prevailed among the members when it became known how ill Mr. Newbigging really was; and at the commencement of the meeting a resolution was passed that a letter of regret at his absence, and sincere hope for a speedy recovery, should be forwarded to him; but the President suggested that a telegram would probably be more acceptable and suitable under the circumstances. To this the members heartily agreed, and the telegram was dispatched forthwith. It is most gratifying to know that the telegram was duly received by him, and afforded him considerable satisfaction.

John Newbigging has all too soon followed his distinguished father (Mr. Thomas Newbigging). The memory of both will serve as a stimulus and an example to members for many years. It cannot be overlooked that the responsibilities of his influential position as Chief Engineer of the Manchester Corporation Gas Department were enormously increased by present-day problems, which are so well understood by all in the gas profession. Little wonder that his physical force collapsed under such a pressure. Without uttering a word of complaint respecting the ever-increasing anxieties in which he was participating, he felt most acutely the burden of it all. While some give their lives for their King and Country in a moment, he just as faithfully performed his duty to the last; and in all respects he has a right to be recognized as a martyr to duty. One feels it only right to pay a slight tribute of respect to his memory after such genuine evidence of real friendship. Indeed, but for his kind promise of assistance under exceptional circumstances, the writer would not have accepted the appointment of President, in succession to him.

15, *New Street, Huddersfield, Nov.* 16, 1916.

ELECTRICITY SUPPLY MEMORANDA.

HOUSEHOLDERS have been urged by the coal merchant to stock their cellars betimes for the winter; those of them who have their houses equipped with gas-fires have no occasion to respond. Gas undertakings, too—those which have not during the war "switched-off" the hiring-out of fires, but have kept the business continually on the flow to expansion—have been suggesting to residents in their areas of supply that, owing to the shortage of fitters, if they require fires connected for the winter, they had better place their orders early. Those who have not done so, will probably find themselves grievously disappointed. Those who have not heeded the electrical searcher for heating business will find themselves in pocket, and warmer during the winter, which the forecast of the weather prophets says is going to be a severe one. However, we have been spending a pleasant quarter of an hour reading an article that Mr. J. D. Ross has contributed to an American contemporary, the "Electrical World." It is on "Electric Heating for Private Residences." The illustrations are found in Seattle—a town which is said to be well supplied with water power, and so is in a position to offer current at cheap rates. But even at the "cheap rates," the one purpose of room heating would swallow the individual incomes of a large majority of the population of the British Isles. In order that the heating load should not interfere with the station peak, it was necessary to arrange for a system of heat storage, which can be done with a water, steam, or hot-air circulating system. In four houses, electricity is used exclusively for heating. One of these houses has four rooms on the ground floor and five rooms above. Downstairs the temperature is maintained at about 70° Fahr. during the daytime, and at 60° Fahr. during the night. The upstairs rooms are all kept at about 65° Fahr. during the day; the control being entirely automatic—thermostats maintaining the desired temperature. Warming is carried out by water heated electrically; the heating system having a total radiating surface of 690 square feet. Four 10·5-KW. bayonet type heaters are used, in conjunction with a 500-gallon storage tank; and the water can circulate through the radiators or through the tank. The time-switch cuts out the electric-heaters entirely during the power-house peak—a period of four-and-a-half hours in the winter months. The stored hot water in the tank is said to prevent any drop in the temperature of the rooms while the current is off, although on the coldest days the temperature of the water in the tank drops from 190° to 104° Fahr. during these hours. Tests taken over a period of two years show that the consumption varied from 79 units in the hottest month to 14,046 units in a month in the depth of winter; the average consumption per month throughout twenty-five months being 4610 units. Assuming the 14,046 units in the coldest months were charged out at 0·5d., this would mean £29 5s. 3d. per month, or, if charged at 0·25d., half the amount. Or take the average of 4610 units per month, and multiply by twelve; and we have a cost, at 0·5d. per unit, of £115. 5s. per annum! In the cases of the three other houses in which electric heating was used exclusively, the consumption for a complete year was 39,320, 57,210 and 54,930 units respectively, which consumptions at 0·5d. per unit would work out to £81 18s. 4d., £119 3s. 9d., and £114 8s. 9d. per annum, and, at 0·25d., at half these sums. Those people who can afford to foot such accounts for room heating alone must be millionaires. While congratulating Seattle on its wealthy inhabitants, we commend the figures to the "Point-Fives" as being worthy of distribution broadcast.

Electric Heating for Millionaires.

An Electric Convector.

For heating halls, shops, and public institutions where there is good cubical space, the gas industry has what it chooses to call "gas radiators," but which should be properly named "convectors." The Carron Company have brought out an equivalent for the electric supply industry; and the "Electrical Times" has described it. It is strongly made of cast iron, and heats mainly, but not entirely, by convection. It consists of four parts: (1) The trap or air-inlet at the base; (2) the body or heating chamber immediately above it; (3) the ornamental grid through which the heated air passes into the room; and (4) the wiring chamber at the top. It is claimed that as the heating chamber and grid are well insulated thermally, practically no heat is lost; the energy absorbed being given out into the room as useful heat. Cold air from outside the building or room is fed through a louvred brick by a duct into the heating chamber, when the trap is so adjusted that it is open to the air-duct. If it be desired, however, to heat and to circulate the air in the room, the trap can be closed by moving a pedal at the base of the stove. Carron open-type standard elements are mounted in the heating compartment; and these can readily be reached for inspection or replacement. Three-heat control is usually arranged for; and the loadings are from 2 to 4 KW. The heater measures 18 in. wide by 30 in. high and 7 in. deep. These heaters, it is stated, have been installed by the Carron Company in many large buildings; one installation alone having a connected load of 200 KW. The name of Carron is influential even for electric heating.

Industrial Electric Heating.

Electric heating in industry does not make any considerable progress; and it is not likely to while there exists the great disparity of cost between it and other agents in realizing high temperatures with a large temperature range. In a paper that Mr. E. F. Collins recently read before the National Electric Light Association of America the point is made that cost is not the only thing to be taken into account. There are other considerations that tell in the economy of the works employing electric heating. There are, he says, the advantages of control of temperature, ease and directness of application, increase of production, reduction of fire risks, decrease of labour, reduced cost of up-keep, and freedom from smoke and gases. All this would be to the good for electric heating, if there were not another system that holds the same advantages and more, and at a lower operating cost, both in respect of money and time. Mr. Collins says a kilowatt-hour must develop 3420 B.Th.U.; but he proceeds to say that he has seen cases where the operator has used double the fuel oil that was required for certain heating, simply because he had not the skill or the care to adjust his mixture at the burner for perfect combustion. That is a poor argument. Though a kilowatt-hour develops 3420 B.Th.U., this does not mean that it is going to be usefully applied. Waste is quite as possible through the neglect of operators with electricity as with gas or oil; while electric-heaters are far from being immune from heat losses and breakdowns. Waste, in fact, with gas through the operator is not a correct (nor the intended) method of applying gas; the correct and intended method is the one producing the largest economy and efficiency. Operators who misuse gas in the manner suggested by Mr. Collins in regard to oil are likely to be brought to

book quickly by not working up to the standard of production and uniformity set by operators who do properly utilize the fuel.

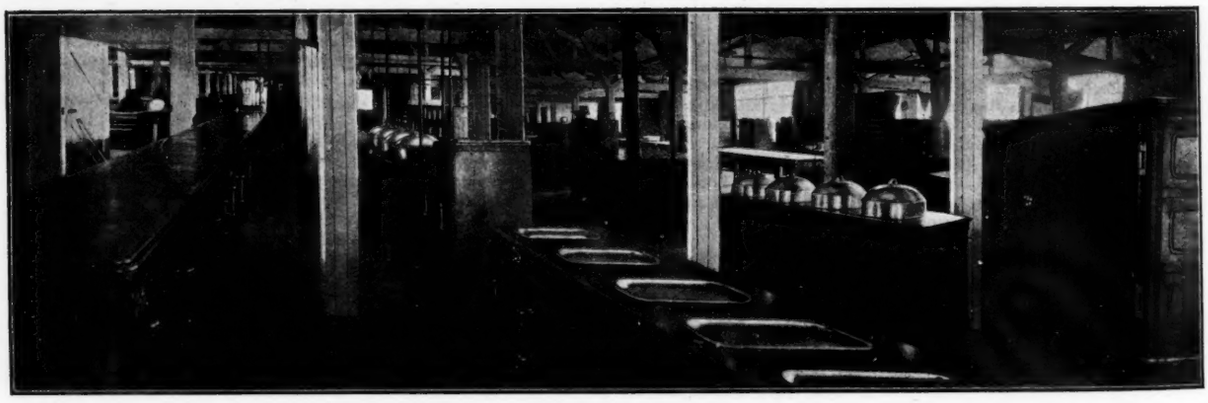
Types of Heater and Application.

In his paper, Mr. Collins only deals with the application of heat in industrial processes that require 950° Fahr. or less—a temperature that gas looks upon as being a very modest performance indeed in industrial work. The three general types of heaters that have been developed to cover this range of temperature are the air-heater unit, the hot-plate or embedded unit, and the immersion type unit. These units are generally of the metallic resistance type; the resistance being of the nickel-chrome combination, which is free from corrosion in the air at temperatures much in excess of the normal operating ones. The units are designed to work singly or in combination with voltages such as 550, 440, 200, and 110, alternating or direct current. The more common applications of one or other type of the heaters named, together with the temperature range, are: Baking of japan (temperature range 300°-600° Fahr.); baking of varnish and paints (100°-300° Fahr.), baking colour enamels (100°-300° Fahr.), baking bread and pastry (150°-600° Fahr.), baking foundry cores (350°-500° Fahr.), baking insulators (200°-500 Fahr.), annealing copper (350°-700° Fahr.), annealing aluminium (500°-800° Fahr.), annealing glass (900°-1000° Fahr.), tempering steel (200°-1000° Fahr.), melting lead (620°-700° Fahr.), melting tin (450°-500° Fahr.), wax and compounds (150°-500° Fahr.), heating coils (100°-1000° Fahr.), heating water (32°-212° Fahr.), steam-raising (212°-500° Fahr.), heating metal moulds (200°-1000° Fahr.), lumber drying kilns (100°200° Fahr.), heating buildings (80° Fahr.), soldering (400° to 650° Fahr.), glue-pots (100°-200° Fahr.), and melting type metal, linotype machines (625°-700° Fahr.). Without giving every item, these are illustrative of the processes to which the heaters are applied. They make a respectable little field of application; but every one of the operations named could be done by gas more economically—unless the price of gas was unusually high and that of electricity unusually low.

Condemnation at Dublin.

It is a long time now since reference was made in the "Memoranda" to the report on the electricity undertaking, that Mr. P. Walter D'Alton made, at the request of a Special Committee of the Dublin Corporation, and to the replies that had been made thereto by the Electrical Engineer (Mr. Mark Ruddle), Mr. H. Mangan, the City Accountant, Mr. F. J. Allan, the Secretary, and Mr. L. J. Kettle, the Deputy Engineer. Mr. D'Alton's report, as we showed at the time, was a comprehensive document, and indicated that very little could have escaped his observation that deserved criticism—technical, administrative, and trading. It was wonderful what an amount of defect in all three respects he found for stricture; the whole undertaking, in fact, appeared to have been conceived, brought into being, and conducted on mistaken lines. An indication as to the directions pursued by his animadversions was given in our news columns last week, together with a glimpse at his views on lines taken by the officials in their replies. We will not again refer to the various matters. In one or two respects, however, we cannot agree with Mr. D'Alton. He states that the question of the relative price of gas does not appear to him to be one of first importance; it is only a guiding question. Our experience of the competition between gas and elecricity assures us that price does take an important part in business getting and retention. But in Dublin the price of gas has been high; and Mr. D'Alton considers that, instead of this being justification for a high price for electricity, it ought to have been an inducement to the Electricity Department to make good effort to popularize electricity for heating and cooking. Perhaps it is as well for the pockets of the people of Dublin that the Electricity Department did not attempt anything of the kind. The Gas Company are putting themselves in a better competitive position, by greater economy and efficiency, than they have been in for many years, and this condition will be enhanced when normal times return. So successful is the Company's new-born enterprise that Mr. D'Alton states that they are obtaining gas-engine business, while as a matter of fact, in face of the electricity undertaking, "no such engines should have room for existence." That is as unkind as it is foolish. All electricity undertakings are not as the Dublin one; and cut-prices are charged by some of them in order to get the power business. But the makers of gas-engines flourish, and have their increase. Perhaps Mr. D'Alton will try to explain this fact, in view of his idea that there should be no room for such engines. His report was not one that was received with unfeigned delight by the officials of the department; and they may possibly regard it as a personal affront that the Special Committee have now asked Mr. D'Alton the terms and conditions upon which he would be willing to undertake the entire management of the concern during a period of three years. He is busily engaged just now on work for the Ministry of Munitions; so that it may be that he will not care for the task of raising the Dublin concern to those ideals which he considers the only practical and rational ones on which to make of it an undertaking and business worthy of the capital of Ireland.

A LARGE MUNITION FACTORY GAS INSTALLATION.



As evidence published from time to time has abundantly shown, gas-cooking apparatus has really become a matter of course in connection with munition factories; but the accompanying illustration, apart from the excellence of the photograph [by Messrs. Miles and Kaye], possesses a peculiarly interesting feature, in that it represents an installation of gas cooking and water-heating appliances which is one of the largest—possibly even the largest—ever put down in any factory. While it is not permissible to say anything which would disclose the identity of this large new factory, we may state that the makers of the apparatus are Messrs. John Wright and Co., of Birmingham.

The photograph does not by any means reveal the true extent of the installation, for it has been impossible to get included in it more than about one-fourth part of the total apparatus actually supplied. Indeed, a portion (which is under repeat order) is still in course of completion. When everything is running, the installation will include a central range and four "Bordo" ovens, a treble "Rostrum" roaster, four "Sector" hot-closets and carving tables, each 8 feet long, with overhead gear, three gas-heated hot-closets of "Sector" design, to act as serving counters, two 32 feet and one 24 feet long, several large stock-pot stands, three 5-feet plate warmers, three "Vega" vegetable steamers, about a dozen 25 and 30 gallon "Infanta" vegetable boilers and tea boilers, half-dozen "Sun" hot-water boilers, and sundry other apparatus.

Rubber Solutions Containing Coal-Tar Products.—The Director of the War Trade Department desires to draw the attention of manufacturers and exporters of rubber solutions to the fact that the export of such solutions as contain coal-tar products and derivatives is prohibited to all destinations, except under licence from the Department. In this connection, it should be noted that the War Trade Department will not be prepared to consider applications for licences to export such solutions containing any considerable percentage of benzol. Manufacturers are accordingly advised to put themselves in touch with the Department of Explosive Supplies, Ministry of Munitions of War, Storey's Gate, S.W., with a view to ascertaining the nature of the substitute for benzol which should in future be employed in the manufacture of rubber solutions.

SOUTHERN DISTRICT ASSOCIATION OF GAS ENGINEERS & MANAGERS.

THE Autumn Meeting of the Association was held last Thursday, at the Hotel Cecil, Strand, W.C.—Mr. W. DOIG GIBB, M.Inst.C.E., presiding. There was an excellent attendance of members.

The HON. SECRETARY (Mr. H. C. Head, of Winchester) submitted the minutes of the last meeting, which consisted of the report that appeared in the "JOURNAL." The members agreed to take them as read.

ELECTION OF OFFICE-BEARERS.

The PRESIDENT said the next business was the election of his successor for the ensuing year. He esteemed it a privilege to be allowed to nominate as their next President his good friend Mr. Westlake, of Exeter. There were many conditions that made this choice a very proper one at the present time. In the first place, Mr. Westlake well-merited the honour they were about to show him. Then it was a good thing they had gone to the extreme west to appoint a President whose immediate work was in that locality. Mr. Westlake had been very active in promoting the interests of the Association on the western side of their district, as well as in the general work of the Association in London.

Mr. PERCY S. HOYTE (Plymouth) seconded the proposal. He remarked that they all in the west regarded it as a great compliment that a Devon man should be the President of the Association. Good men came out of Devon in the old days; and he believed Mr. Westlake would be the first President they had had in the Southern District Association who was a Devonshire man. They all believed he would make an admirable President for the coming year.

The motion was carried with applause.

Mr. W. N. WESTLAKE (Exeter) said he was grateful for the honour the members had done him; and he could assure them it was one that he appreciated. It was a position, especially in these times, of considerable responsibility; and he hoped his experience in dealing with the work of the Association in the West of England, and rendering some slight service in the work in London, would help him to carry out the duties of the higher position in such a manner as would give the members complete satisfaction. He hoped, when his term of office was over, he should have the satisfaction of handing on the responsibility to his successor with the lustre of the chair undiminished. He also much appreciated the honour on account of the point mentioned by Mr. Hoyte. It appeared that he (Mr. Westlake) would be the first President of the Association from Devonshire. Until this moment he was not aware of it. Many men of mark had occupied the chair; and its prestige had in consequence been raised to a very high level. This being so, it was with a little nervousness that he consented to follow such able men; but with the generous help of the members, he might be able to perform the duties in such a manner as would at any rate maintain the prestige as he received it.

Mr. JAMES PATERSON (Cheltenham) proposed Mr. W. B. Farquhar as the Vice-President for the ensuing year. He was well known to them all; and he (Mr. Paterson) could assure him he would receive from his fellow-members all support in the office to which they proposed to elect him. The Vice-President of to-day became the President of to-morrow; and in electing Mr. Farquhar, they would find in him a gentleman to whom they could look to step forward when the time came to further office in the service of the Association.

Mr. HOYTE seconded the motion, which was cordially passed.

Mr. FARQUHAR, in acknowledging his election, said the members might rely upon his best efforts being put forward to uphold the office of Vice-President.

On the proposition of Mr. P. C. CLEASBY (Guildford), seconded by Mr. P. DREWETT (Fareham), Mr. C. F. Botley (Hastings) was elected a member of the Committee. The second new member of the Committee was Mr. J. M. Campbell (Margate), who was elected on the motion of Mr. ARTHUR VALON, seconded by Mr. C. V. BENNETT (Rochester).

The PRESIDENT said he was very pleased to welcome both gentlemen to the Committee, and especially Mr. Campbell, for they served at neighbouring drawing-boards in a contractor's firm in Glasgow through some strenuous years; and their friendship had run through the years since.

Both the new members of the Committee acknowledged their election.

Moved by Dr. H. G. COLMAN, seconded by Mr. G. M. GILL (South Metropolitan Gas Company), Messrs. J. L. Chapman and A. Dougall were re-elected Hon. Auditors.

Mr. WESTLAKE moved the reappointment of Mr. Head as Hon. Secretary and Treasurer. He remarked that Mr. Head had served the Association with conspicuous ability for a number of years. The opportunity might be taken to say a few words regarding Mr. Head's services to the West of England in connection with the Commercial Section. Under the auspices of the Association, they had meetings in the western district; and these had been of considerable value to the whole of the undertakings that became members and whose representatives attended the meetings. They had had on every occasion but one the privilege of Mr. Head's presence. It was a considerable distance from Winchester to Exeter and other places where the meetings had been held; and so they greatly appreciated the time and trouble that Mr. Head had given to the section.

Mr. W. E. PRICE (Hampton Wick) seconded the motion, which was unanimously carried.

The PRESIDENT thanked Mr. Head for the excellent way in which he had seen him through his year of office in these strenuous times.

Mr. HEAD thanked the members for his re-election, and the speakers for their kind remarks regarding his services.

ELECTION OF NEW MEMBERS.

The HON. SECRETARY reported that there were nine applications for membership, which had been passed by the Committee. He would read the names in the order of application: Mr. Percy Parrish, Chemical Works, East Greenwich; Mr. Edward Allison, of Gosport; Mr. H. G. Ruggles, of Leighton Buzzard; Mr. T. S. Lacey, of Beckton; Mr. J. S. Thorman, Chief Assistant to Mr. Lacey; Mr. P. S. Wilkins, of Godalming; Mr. P. S. Kitto, of Sutton; Mr. J. B. Cattle, of Dartmouth; and Mr. Frank Portass, of Ware.

On the motion of Mr. WESTLAKE, seconded by Mr. J. W. AUCHTERLONIE (Cambridge), the gentlemen named were duly elected.

REPORT OF THE COMMERCIAL SECTION.

The HON. SECRETARY, in presenting the report of the Committee of the Commercial Section (of which he is the Chairman, and Mr. R. S. Tobey, of Horley, the Hon. Secretary), said he should like to say that he thought the activities of the Commercial Section had increased rather than decreased. The membership had certainly increased. The meetings in the West of England to which Mr. Westlake had kindly alluded had increased not only the membership of the Commercial Section and of the Association, but he thought they had shown those members who resided in the West of England that, though it was often difficult to come to London to attend the meetings, the Association was not only a name, but a really living thing. In these circumstances, he thought the meetings in the West of England had done a great deal of good. The report which he now presented had been adopted by the Commercial Section at its annual general meeting last month, and at the meeting Mr. H. Buckley (Windsor) was elected Chairman for the ensuing year. He hoped that the Commercial Section, in its wisdom, would see fit to follow the parent Association, and that its Chairmen in future would graduate in much the same way as the Presidents of the Association did by passing through the Committee, and through the chair in due course.

The report of the Committee was as follows:

During the year one member has resigned and eight have joined; the total number of members now being seventy.

During the season eight general meetings have been held in London; the average attendance being sixteen members. In addition, four meetings have been held in the West of England; the average attendance being eleven members.

Coal.—Deliveries of coal during the past few months have been better than earlier in the year; and, in many cases, depleted stocks have been greatly augmented. Contracts generally were renewed at advances ranging from 3d. to 2s. 6d. per ton on 1915 prices, although some coal factors were reluctant to tender for new contracts. A joint Commercial Section meeting was held in Manchester, on May 18, to consider the question of coal, labour and residual markets, to which meeting this Association sent representatives.

Coke.—The demand for this product has improved, and stocks have greatly diminished; in many cases the demand being far greater than the supply. Prices ruled higher than previously.

Tar.—Many gas companies in the district have erected tar dehydration plants, and obtained good prices, ranging from 6d. to 9½d. per gallon for the light oils extracted. The demand for tar for road purposes has been good; and last year's prices have been maintained in most cases.

Toluol and Benzol Extraction.—Oil washing has been commenced at some works, and excellent results obtained. One of the members gave a paper on this subject, exhibiting a small model of the plant he had erected at his works. The reading of this paper led to a most interesting discussion, in the course of which Dr. Colman and Mr. Carr gave much valuable information. The demand for more and yet more toluene and benzene for war purposes by the Ministry of Munitions must tend to stimulate members to do all in their power to provide as much as possible of these essentials to the successful conduct of the war.

Sulphate of Ammonia.—The home demand for sulphate of ammonia has been much greater than in previous years, and the work of the Board of Agriculture in urging farmers to use this fertilizer has borne good results. The prices fixed by the Board and accepted by the Sulphate of Ammonia Association were considered by many to be low, more especially considering the increased cost of acid and labour, and the prosperity of the farmer at the present time. The subject has been carefully considered and discussed, and representations have been made by the section of the Association whose sales manager attended one of the meetings in the West of England. The supply of B.O.V. has been a great anxiety to many members, and high prices have been asked and paid, in some cases as high as £6 9s. 6d. per ton f.o.r. London.

B.C.G.A.—The good work of the B.C.G.A. has been continued with

undiminished energy in spite of the war; its activities being especially directed to calling attention to the value of gas for industrial and munition purposes.

Other Subjects Discussed.—(1) The phenomenal breakdown of meters at the present time. (2) Lighting restriction order in relation to public lighting contracts. (3) Pooling of coal-waggons. (4) Enlistment of gas workers. (5) Naphthalene and benzol extraction with effects on illuminating and calorific values. (6) Prices of retort carbon and spent oxide. (7) Increase in prices of stoves as affecting hire rates. (8) Gas supplies to war and other public departments. (9) Military orders for men employed outside gas-works. (10) Shutting off gas supplies from works in the event of air-raids. (11) The fixing of telephones on gas-works for use in the event of air-raids, and the liability of charges made for same. (12) Organization of the gas industry. (13) Public lighting contracts as affected by the Daylight Saving Bill.

EDUCATION OF GAS-FITTERS.

The PRESIDENT said the only matter to be reported in connection with this subject was that there were 113 forms sent forward. As members were aware, the Hon. Secretary and the President of the District Association in the area in which gas-fitters were operating who wished a certificate had to sign the applications. They had had the pleasure of signing the 113 applications of gas-fitters, all of whom were employed by the Gas Light and Coke Company.

DEATH OF MR. FARRAND.

The PRESIDENT said that, before going to the last item on the *agenda*, he wished to say that they all mourned the death of Mr. F. F. Farrand, of Ryde. He came of a gas-engineering family, because his father was a gas engineer before him, and he was succeeded by two sons, who were both gas engineers. A letter of sympathy had already been sent by the Hon. Secretary; but he (the President) was sure it would be the wish of the members generally to show their respect for a member who had gone, but for one who earned their respect during his life.

The members silently rose in their places.

OIL-WASHING OF GAS FOR BENZOL EXTRACTION.

There followed a long and interesting discussion on this subject, which will be found reported on pp. 391-6.

The members before parting took tea together.

AMERICAN GAS INSTITUTE MEETING.

Notes on the Papers Read.

THE reports of Committees submitted at the eleventh annual meeting of the American Gas Institute, held in Chicago last month, were dealt with in last week's issue of the "JOURNAL" [p. 333]; and, in the same way, opportunity may now be taken to indicate shortly the subject-matter of the two dozen or so papers that were presented on the occasion.

Before doing this, however, there is one more report which should be noticed—that of the Committee on the Analysis of Accidents. It seems that the work done by them and by other Committees of the Institute has on a number of occasions during the past year been used to prove that the gas industry cannot be properly classified as "extra hazardous." Of 10,000 cases analyzed, accidents peculiar to the industry—*i.e.*, arising from leakages of gas and explosions—were responsible for not quite 5 per cent. This, say the Committee, being positive evidence, should "prove convincing to any State, body, or insurance committee having to do with casualty ratings for the industry."

MANUFACTURING SECTION.

The Portland (Oregon) Gas Company, who operate in the second largest grain-shipping centre in the United States, owing to growth of demand and inefficiency of the old plant, decided in 1910 that it would be better to remove the manufacturing operations from the old works in the business part of the city to a new site on the outskirts; and by the end of October, 1913, the new scheme was practically completed, and was placed in operation. A description of the work carried out was given by Mr. E. L. Hall, the Chief Engineer, in a paper on the "New Oil-Gas Plant at Portland." The production of gas is from crude petroleum; this being the process by which the greater portion of manufactured gas on the Pacific Coast is procured. While manufactured in apparatus and by a process somewhat similar to the manufacture of water gas, the oil is said to produce a gas strikingly resembling in many ways coal gas. This is shown by analyses of typical Portland 570 B.Th.U. oil gas. The only important bye-product, however, is a large quantity of very pure carbon, comprising frequently as high as 50 per cent. of the weight of the original oil. In fact, the principal problems arising in the manufacture of oil gas present themselves in connection with this residual. The manufacture is also accompanied by the usual bugbears of naphthalene, cyanogen, and sulphur, without the compensation of ammonia recovery.

At Portland, there are five gas-machines, each of which has a generating capacity of 2 million cubic feet per day. From these the gas passes through wash-boxes, and then to primary tar-scrubbers and final cooling scrubbers, on to a relief holder. The gas is taken from this through oil-washers, gas-washer, and purifiers, to the station-meter and holders. To overcome any naphthalene troubles, Mr. Hall, profiting by European experience in anthracene oil washing, instituted experiments in 1907 and 1908, as a result of which an oil-scrubber was installed at the old plant. This experience led to crude oil-washers being put up at the new works; and naphthalene complaints are now practically unknown. About 5 gallons of crude oil are made to circulate through the oil-scrubber per 1000 cubic feet of gas made.

As to organic sulphur, the author says the quantity present would have barred the oil-gas process entirely, if means had not been discovered for eliminating this impurity. The system was described by him before the Pacific Coast Gas Association in 1908,* and before the Institute two years later by Mr. H. Papst. Mr. Hall remarks that it is gratifying to him to note that the process has since been, with the necessary modifications to overcome patent rights, successfully introduced by the South Metropolitan Gas Company of London. The process consists essentially in purifying the raw gas from hydrogen sulphide, and raising it to a temperature of from 900° to 1200° Fahr.—thus breaking-down the organic sulphur to hydrogen sulphide, cooling the gas, and then again passing it through a set of purifiers to eliminate the hydrogen sulphide produced.

The account given by Mr. J. M. Spitzglass, in a paper on "Measuring the Flow of Unpurified Gases at High Temperatures," of experimental work conducted in the works of the People's Gas Company, of Chicago, was noticed in abstract form on p. 185 of the "JOURNAL" for the 24th ult.; and now that the paper itself is to hand, it seems that, in order to explain more fully what the author had to advance, it would be necessary to reproduce the whole of the letterpress, together with the eleven pages of tables and dozen or two diagrams. The work done consisted in measuring gas products at the outlet of the water-gas generators; the object being to show the advantages to be derived from these measurements, in regulating the operation of a water-gas set. An analysis of the results shown by the charts, and a comparison of the various indications, leads to the conclusion, the author says, that the proper place for the measurement is at the outlet of the wash-box. He hopes that, with the aid of the tables, and the general outline of the work given in the paper, the measurement of saturated gases at higher temperatures will be much simplified. There are illustrations of the various special designs of Pitot tube experimented with.

Various conditions have created difficulties in procuring good gas oil which were not experienced in years gone by; and the imperative need for an understanding as to what constitutes good or bad gas oil—some of the oil now offered as gas oil being so unsatisfactory—led Mr. F. L. Weisser to contribute a paper on "Oils for Water Gas." He set himself to indicate, as accurately as possible, under approximate operating conditions, the characteristics of various grades of gas oil, the composition of which has been determined, with special reference to the most important factors from a gas-making point of view. The apparatus used for cracking the oils is described, and diagrams are included illustrating a method of comparing the relative values as gas-producing material of various grades of oil. He states that the use of gas oil containing more than from 20 to 25 per cent. of asphalt basic oil will create some trouble, which will be multiplied in proportion to the increase of this component. A sheet of sample calculations, and data and result sheets of each sample of oil cracked-up at various temperatures, and of the different samples of oil cracked-up at the same temperature, appear at the end of the paper.

"How One Gas Company Handles Its Coke Business" was explained by Mr. F. W. Seymour, who described the coke system of a plant distributing 93 per cent. coal gas made in horizontal retorts. The coke resulting from the manufacture of this gas equals approximately 60,000 tons a year, 98 per cent. of which is sold to the domestic market. The retail value of the coke sold in this manner—*i.e.*, to the domestic market—is equivalent to 40 per cent. of the retail value of the gas distributed by the company. Some years ago, mixed gas was distributed; sufficient water gas being made for only enough coke to be produced to meet the business which came to the company without any effort. The rapid rise, however, in the cost of the raw materials entering into the manufacture of water gas modified the situation so quickly and so completely that it was necessary to displace water gas by coal gas, and build up a market that would dispose of the additional coke produced.

In the retort-house there are De Brouwer hot-coke conveyors, which take the coke to a De Brouwer cross conveyor. The latter then drags the coke through a quenching tank, and carries it up to a 20-ton cooling bunker. From this, there are belt conveyors—one leading to the car-loading dock, and the other to the screening tower. In the screening tower, the coke is separated into three sizes—furnace, stove, and breeze. From the tower, the coke is conveyed by a manual industrial railway, with 1-ton tipping-cars, either to the retail bins (of which there are five, with a capacity of 40 tons each), or it is dumped over trestles into stock. The primary reason for the selection of the De Brouwer conveyor system was coke quality. Though, says the author, there is great disagreement among authorities on the proper methods of coke quenching, certain points seem to be essential. In order to produce a domestic furnace coke with a moisture content not exceeding 6 per cent., and possessing as grey a colour as possible, quenching should be done quickly over a layer of coke which is not too thick, and with an excess of quenching water. Sufficient water must be used to extinguish all fire in it, leaving the interior with enough heat to evaporate the moisture that is in the outer

* See "JOURNAL," Vol. CIV., p. 204.

shell. The possibilities of meeting these conditions and producing a uniformly quenched product have been vastly augmented by the addition of the quenching-tank. By the method adopted, the moisture-content can be kept well under 6 per cent. In fact, on a test run covering two weeks, the domestic furnace size showed an average of 2·9 per cent. The quenching tank is of such a size that the breeze and fine, which are usually washed away, settle and are retained within it.

The disadvantages as well as the advantages of the De Brouwer hot-coke conveyor are discussed in the paper. The advantages are stated as: Quenching is made uniform, and is under control; combining the functions of quenching and conveying; adaptability to any speed and capacities of routine; reduction of labour; elimination of steam from retort-houses, and the bettering of the working conditions; and breeze and fine are not washed away with the quenching water. The disadvantages are: Coke breakage is severe; power and maintenance are large items; interruption to routine in case of breakdown; safety hazard; and high first cost.

An illustrated address upon "Recent Developments in Bye-Product Coke-Oven Construction" was given by Mr. C. J. Ramsburg, of the H. Koppers Company. By the aid of a number of lantern slides and moving pictures, he described, among other things, the new plant erected for the Laclede Gaslight Company, at St. Louis. This plant is so designed as to operate either with producer gas or gas from the ovens.

Chemical Section.

Of four papers before us which were submitted in the Chemical Section, two are reproduced elsewhere in the "Journal." The author of one of these is Mr. J. W. Shaeffer, of Milwaukee, who dealt with the "Equivalent of the Observed Heat Value of the Light Oil Scrubbed from Coke-Oven Gases" [p. 396]. The conclusion he arrives at, as the result of inquiries sent to thirty bye-product coking plants, including those using various types of ovens and many different kinds of coal, is that the actual loss in the gross calorific value of the gas due to the removal of light oil is about 5·8 per cent. at plants when the removal takes place with a fair degree of completeness. The observed loss due to the removal of the light oil is considerably greater than the actual loss. An analysis of bye-product coke-oven fuel gas appears in the paper; and this shows that 1·1 per cent. of light oil by volume furnishes 7·4 per cent. of the total heat which is formed when the gas is burned.

The other paper which is given in full [p. 398] is by Mr. E. J. Murphy, of Brooklyn, on the "Removal of Sulphur from Spent Oxide," and, as he says, is offered as a suggestion for the economical use of a material which at present is of comparatively little value. It has already been shown that distillates from coal tar dissolve considerable amounts of sulphur at a temperature approaching their boiling-points; and a patent has been taken out in France for the extraction of sulphur and nitrogen from spent oxide by this means. Mr. Murphy, having only water-gas tar available, made up his mind to see whether distillates from it possessed the same property of dissolving sulphur. The results of tests (though it is pointed out that these are all on a laboratory basis) are almost identical with those previously arrived at by Pelouze, who used coal-tar distillates.

"A Study in Gas Oils" was given by Messrs. R. C. Downing and E. F. Pohlman—the importance being pointed out of extensively investigating the oils themselves, as well as the conditions which affect their utilization, if the most economical use is to be made of oil in carburetted water-gas manufacture. At the present time, it is particularly important because of the existing high prices in the oil market. The authors felt that, while much has been written concerning petroleum oils and hydrocarbons in general, the literature which serves as an aid in the practical identification and valuation of gas oils is very scanty; and the object of the paper is to summarize items of useful chemical knowledge pertaining to gas oils, as well as to present some interesting conclusions regarding their action under the influence of heat, which have been derived from tests made during the past few years.

The first of the two parts into which the paper is divided consists of a discussion of the various physical and chemical tests applied to gas oils; and at the outset attention is called to the various physical tests which may be of value in obtaining a better understanding of oils in general. They are summarized as follows: Physical constants—colour, odour, specific gravity, refractive index, surface tension, viscosity, flash and burning points, heating value, and fractional distillation. Chemical characteristics—ultimate analysis, sulphur content, absorption with sulphuric acid, absorption with fuming sulphuric acid, bromine number, and formolite number. The authors point out that the great difficulty in making use of these tests lies in the fact that a basis of comparison is not usually available; but when it is possible to actually decompose or gasify the oil on a small scale in the presence of blue gas, the sperm and heating value of the gas made, together with the quantity produced, furnish an excellent idea of the value of the oil. In addition to this, a basis is provided with which it is possible to compare and determine the value of the other tests made on the oil. When such a basis is employed, the laboratory device used should, of course, give results somewhat comparable with those obtained in practice. The apparatus used by the authors to comply with this requirement is described and illustrated in the paper; but as they foresee that it would be impossible for many laboratories to employ such a device as theirs for testing oils, a study has been made of the more common and simple tests usually applied to them, with a view of furnishing an intelligent basis of interpretation. Some of the conclusions arrived at are given, under the different headings of physical constants and chemical characteristics already quoted.

Colour, they say, offers but little indication as to the real characteristics of an oil. Specific gravity, while a useful figure as an aid in calculating various works results, it is now generally known cannot be depended upon to furnish the required knowledge for judging an oil. Rittman's conclusion concerning the refractive index is that it varies proportionately with the gravity, and offers no additional information to that which the gravity test supplies. As to surface tension, there does not seem to be much logical relation between this test and the gas-making value of an oil; while the viscosity test is only useful in indicating the ease with which gas oils may be handled in the pumps. Though the flash and burning point determination is necessary from the standpoint of safety, no uniformity exists between the flash-point and enriching value. As to heating values, failure of the B.Th.U. results to indicate the gas-making quality of an oil is said to be no doubt caused by the different rate of decomposition of oils when exposed to heat.

It is now, the authors remark, an established fact from a gas-making standpoint that paraffin oils rank first as to their enriching value, olefines are slightly inferior, and are followed by naphthenes. Aromatics are decidedly inferior. As yet but little study has been made as to the value of an ultimate analysis in rating gas oils. That there is a possibility of this determination becoming useful is evident from a consideration of their chemical composition. The ultimate analysis is, however, somewhat difficult to perform, and will never find favour as a quick test. Sulphur determination is very useful, in that it provides information as to the burden that purifying boxes will be obliged to carry. With reference to sulphonation, the authors say it is evident that a method which determines the portion of paraffin unsaturated and aromatic compounds should be of value in rating oils; but, from the data secured, it appears certain that bromination as an individual test to determine the quality of oils cannot be depended upon. Obtaining the "formolite number" from the weight of a precipitate formed when treating oils with sulphuric acid and formaldehyde, was tried, but found tedious and difficult to operate; and the results were not promising enough to justify further work on this line.

An investigation of the effect of various gaseous atmospheres upon the results of cracking was undertaken with the object of determining the influence of each constituent of the blue gas upon the quality and quantity of the end products. In order to make comparisons, special care was taken to maintain the time of contact approximately the same with each gas employed. The atmospheres used were nitrogen, carbon dioxide, carbon monoxide, hydrogen, methane, blue gas, and a mixture of blue gas with 10 and 20 per cent. of steam respectively. The results are set forth in the second part of the paper, which will be more fully dealt with in a subsequent issue of the "Journal."

The remaining paper in the Chemical Section is on the subject of the "Purification of Water for Gas-Making Purposes;" the author (Mr. W. H. Fulweiler) describing several typical plants, and discussing briefly their operating costs and the relation that such costs should have in the consideration of the profitable installation of water-purifying systems in gas-works. The paper is accompanied by numerous plans and photographs of installations. The contribution represents a lot of work on the part of the author; not the least useful feature of it being a ten-year American bibliography of the subject.

Platinum and Coal Gas.

Under the heading of "Technical Progress" in their last issue, the "Ironmonger" wrote: Platinum, platinum sheets, and platinum utensils are used in chemical processes on account of their extreme insusceptibility to fusing; but only pure platinum can resist high temperatures—alloys melting at much lower temperatures. Some new experiments lately made by Mylius and Hüttner at the Physical-Technical Institute in Berlin show that coal gas has a destructive influence on technical platinum at 600°, causing a layer of soot which, on subsequent burning, leaves behind the metal in contact with it in a porous state. Synthetic coal gas at 600° remains indifferent towards pure platinum and pure platinum iridium sheets. The effect of coal gas is due to its carbon disulphide, which combines chemically with the platinum, forming unstable compounds, which at 600° are reduced to sulphuretted hydrogen and carbide-like residues. The impurities in platinum, especially iron and rhodium, have a great influence on the formation of soot by the heated coal gas. With rhodium, the reaction begins already at 100°; and pure platinum can be distinguished from impure in this way. Similar effects as with coal gas are shown with other luminous flames. In the effect of gas-flames with a plentiful current of air, as in the case of bunsen burners or blast-engines, the destructive attack on pure platinum is principally limited to the volatilization of small quantities of the metal. To ensure the durability of the platinum utensils, the gas must not contain a large proportion of sulphur; while a plentiful supply of air is of the greatest importance. A small iridium content in the platinum is harmless, but rhodium gives rise to disturbances.

POWER PRODUCTION.

THE "MONEY SIDE" OF TOWN'S GAS AND PRODUCER GAS INSTALLATIONS.

By "M.J.Inst.E."

In placing these notes before the readers of the "Journal," the author would explain that they have been compiled in anticipation of the great industrial war upon which we must eventually enter, and in which, given an adequate degree of protective Legislation and efficient organization, no factor will exercise a more decisive influence than will the costs of power production.

In previous articles dealing with the costs of power generation, it has been pointed out that, so far as competition from the electrical industry is concerned, we most assuredly have ourselves to thank for the undeniable pull which that industry, generally speaking, has over us in the matter of the power consumer, inasmuch as we have looked with a certain degree of lofty disdain upon a rival whose characteristics we have never taken the trouble to understand, and whose applicability for a whole host of purposes demanding some form of mechanical power application it is useless to deny. In short, we have committed the fatal error of underestimating a very powerful opponent; and, confident in the known economy of the gas-engine to retain for it "a place in the sun," have made very little effort to become *au fait* with the principles underlying the operation of the electric motor—being content to meet the claims advanced on its behalf by a simple negation.

There has been a positive deficiency in the information brought to bear upon this particular phase of power competition. Technical considerations, generally speaking, have been concentrated more upon the production of the gas than upon the side of the industry dealing with the utilization of the finished product. For many reasons with which it is intended to deal in a later portion of this article, this phase of power competition cannot really be classified under the same heading as that under which we should consider that other, and in many ways entirely different, phase which deals with the growing popularity of gas producer plants as a source of fuel supply to internal combustion engines.

In the case of the gas-electric power competition, the competing power producers have no single common characteristic; whereas the rivalry between town gas and producer gas is simply a question of the most suitable fuel supply to an engine upon whose merits both competing parties are in absolute agreement. One parallel, however, actually does exist. In the case of the electric motor, we have not, to any extent, taken the trouble to familiarize ourselves with those technical details which would have enabled us to get behind the hypothesis with which this machine has been pushed into more extended use than would have been possible had the resistance been of a stronger nature than was actually offered—stronger by being technically fortified.

In exactly the same manner, though not perhaps to so great an extent, have we been reluctant to familiarize ourselves with the competitive points of producer gas plants, and have trusted to keep such installations out of our districts by a parrot-like repetition of the bald statement that "under such and such a size engine it will not pay to put down such a plant." Business men, however, are apt to be rather sceptical regarding any statements which cannot be backed by figures and data regarding running costs; and to effectively meet this class of competition, gas engineers should be in a position to lay before the prospective power user a close and unassailable estimate of the cost of handling a given load by means of (1) an engine working with town's gas, and, alternatively, (2) an engine working in conjunction with a producer gas plant.

The danger of losing promising power loads as a result of technical inefficiency is a very real one; and if such competition is to be intelligently met and handled, it is essential that all technical considerations bearing upon the subject should be equated, so far as is possible, to the commercial factors of pounds, shillings, and pence—the only basis which a business man can, of course, afford to recognize.

One thing is certain—the development of the producer gas plant, particularly in the smaller sizes and the high degree of efficiency which such plants are attaining, must ensure that competition from this source will be much more severe in the future than it has been in the past; and there is every reason why the gas industry should go steadily ahead with an intelligent form of campaign for the popularizing of the use of town's gas for the operation of all small and moderate sized power plants, having due regard to the respective rates for gas, coke, and anthracite prevailing in any particular district.

The vending of gas has now ceased to be a merely commercial matter, particularly in our great industrial centres. It has acquired a large technical side; and the more this is recognized, studied, and brought to bear upon the subject of power competition, the greater will be the advantage. The actualities of town's gas, of producer gas, and of electricity can no longer be dissociated from the commercial work of the industry; and failure to recognize this fact is bound to create an unpleasant future position for those on whom rests responsibility for gas trading.

Generalities have had their day in this power business, and, in the interests of the retention of our existing business and of future developments, it is essential that we should get to grips with every phase of the question of power competition on the soundest of all bases—namely, that of pounds, shillings, and pence. Naturally enough, the producer gas plant is not the sealed mystery to the gas engineer which, in the past, the electric motor has unfortunately been permitted to be; but, at the same time, the information which he possesses on the subject of such plants does not always take the form which will enable him, by sheer force of sound commercial argument, to keep producer gas installations out of his district.

In this article, the author hopes to indicate the general lines upon which, in his opinion, the producer gas plant may be successfully combatted. This, like all the other more widely known types of power producing apparatus, has its own particular sphere; and the matter should be handled in an open unbiased manner, and with a due regard to all local conditions pertaining to any particular business. The engineer who pushes a town's gas supply for an installation regarding which the general conditions—such as load factor, cost of fuel for the producer, and the rate for town's gas—are distinctly favourable to the producer plant, is acting against his own interests in particular and against those of the gas industry in general.

The Producer.

As a means for the production of cheap power, and for use in situations and localities where a supply of town's gas is either not available or is too dear to warrant its employment, producer-gas plants have been installed in large numbers all over the country. The fuel used in the smaller installations is anthracite or gas coke; while in the larger plants ordinary bituminous coal is distilled in producers of the Mond type working in conjunction with bye-product recovery plants.

In connection, however, with the subject of this article, one is chiefly interested in the former type—namely, the small non-recovery plant burning anthracite or gas coke as fuel. This class of producer is generally of the suction type, and derives its name from the fact that a partial vacuum is created in the producer itself when the engine (or engines) on which it is working is on its suction or charging stroke. During such periods a mixture of air and water vapour is drawn through the bed of incandescent fuel in the producer when the steam is split-up into its component elements, hydrogen and oxygen. The latter, with the oxygen content in the air drawn through the fuel bed on the suction stroke of the engine, combines with the carbon in the fuel to form carbon dioxide (CO_2) and carbon monoxide (CO); the former being kept as low as is practically possible in producers of this type. These gases, together with the hydrogen and other elements, pass forward to the cleaning and cooling portions of the plant.

The power gas ultimately delivered into the engine from the best types of producer plants is of a cool and clean quality, having an average calorific value of about 135 B.Th.U per cubic foot when generated from clean anthracite fuel of about 14,800 B.Th.U. value. This value of 135 B.Th.U. forms the recognized basis upon which producer gas engines are rated.

It will be apparent that the rate at which gas is generated in a plant of this type must be to a certain extent intermittent, owing to the fact that the vacuum or "pull," on which the plant relies for its operation, is not a constant factor, but varies according to the number of suction or charging strokes of the engine. which, in turn, will vary either in number or intensity with the load on which the plant is running. If the load be a varying one, it will be recognized that the periods during which the mixture of air and water vapour is being drawn through the fuel bed of the producer are not only intermittent but are also irregular. The effect of these conditions of load is that there is lack of uniformity in the quality of the gas generated by the producer at periods of light or irregular loads, and a consequent falling off in both the economy and satisfactory running of the plant.

It would appear that throttle governed engines are more suitable for operating on producer gas plants of the suction type than are engines governed on the hit-and-miss principle, on account of the fact that in the former type there is no periodic irregularity in regard to the action of the suction stroke on the producer—there being a charging stroke on each cycle of the engine irrespective of the load.

With a hit-and-miss governed engine working under a varying load, the periods of partial vacuum created within the producer are equal in intensity but irregular as regards periodicity; whereas in a throttle governed machine the intervals at which such pulls occur are quite regular—the degree of vacuum created varying with the load on the engine. In any case, with a producer gas plant of the type with which we are concerned these factors, either singly or together, tend to create an obstacle to the economic operation of such plants when running under light or irregular loads; and the gas engineer who is up-against a producer plant proposition should be fully alive to the importance of such factors.

In other types of producers efforts have been made to overcome these obstacles by the employment of auxiliary means for the production of the suction or the pressure (according to the type of apparatus) on which the producer depends for its operation. But these means only add to the first cost, and to the complication of the plant and do not appeal to that type of consumer with whom we are immediately concerned. It must not be forgotten, when going into the question of plant load factor, that an average good plant load factor may be made up of a widely and continually varying load, which may of itself have a very detrimental effect

upon the low costs of operation of which under a steady load factor the plant might be capable.

In using the term plant load factor, it may be explained that this factor is a ratio (expressed as a percentage) between the actual output of the engine and that maximum output of which it would be capable if run all the time at full load.

It is proposed to follow this introductory article by others dealing with the different factors which have a bearing upon the running costs of producer gas plants, and, by means of suitable examples, to show the relationship existing between such costs and the corresponding costs in respect to engines of similar capacity working on town's gas.

RISE AND DEVELOPMENT OF BYE-PRODUCT COKING.—V.*

[Communicated.]

The Recovery of the Bye-Products.

From the time of the introduction of bye-product recovery in connection with the operation of coke-ovens (about the year 1881) until the beginning of the twentieth century, the methods in use were the same as those still obtaining on gas-works. The hot gas leaving the oven contained the whole of the water vapour, the tar, ammonia, benzol, &c. The crude gas was passed through a series of coolers by means of which condensation was brought about, the tar was deposited, and the water vapour was also condensed in the form known as ammoniacal liquor. This liquor contained a large proportion of the ammonia compounds present in the gas. Simple cooling, however, was not sufficient to bring about the complete extraction of the tar and ammonia from the gas, and it was necessary to make use of some mechanical apparatus for removing the last traces of tar. In order to recover the whole of the ammonia, it was further necessary to wash the gas by water; and this operation was carried out in scrubbers. After the removal of the remaining traces of tar, the gas was passed up towers packed with boards or coke, down which a stream of weak ammoniacal liquor or else water was allowed to trickle, thereby causing the solution of the ammonia salts and eliminating them from the gas.

On most gas-works, the ammoniacal liquor so recovered is worked up until it reaches a certain definite concentration, corresponding to 2 to 3 per cent. of ammonia, and it is then sold in bulk to large dealers, who utilize it for the manufacture of sulphate of ammonia or of strong liquor ammonia, and in some cases in the ammonia-soda process for the manufacture of sodium carbonate. In the first instance, bye-product coke-oven proprietors followed out the same method of procedure; but it soon began to be realized that it was very economical and more profitable for the coke-oven people themselves to manufacture sulphate of ammonia. This was done by the distillation of the ammoniacal liquor in two stages. The ammonia is present in liquor in the form of (*a*) free ammonia salts, as ammonium carbonate, sulphide, &c., which decompose with simple boiling, and (*b*) fixed ammonia salts—the principal of which is ammonium chloride—which require to be boiled in the presence of a stronger base in order to liberate the ammonia. Lime is the agent usually employed. The ammonia so liberated is then passed into a saturator which contains sulphuric acid, the acid absorbing the ammonia and forming crystals of this substance, which are removed from time to time.

This process of bye-product recovery is unquestionably a very indirect one, as the ammonia is first dissolved in water and then expelled therefrom by distillation. The obvious improvement is for the crude gas containing the ammonia to be passed directly into a bath of sulphuric acid, and so bring about the formation of sulphate of ammonia without any of the intermediate operations of scrubbing and distillation. Such a process, however, is attended with very serious difficulties, and the early experimenters working along these lines—notably, Herr Franz Brunck, of Dortmund—were unable to put the process on a satisfactory footing. The idea was taken up by other inventors; and, as a result of their efforts, we have to-day various forms of highly successful direct-recovery processes, perhaps the best-known being those of Koppers and Otto. The former is really a semi-direct process, while the latter is a true direct-recovery process in the full sense of the term.

In the Koppers process, the crude gas coming directly from the ovens is cooled down to atmospheric temperature; a considerable proportion of the tar and the whole of the ammoniacal liquor being thereby eliminated. The hot gas direct from the ovens enters the cooler, where its temperature is reduced to about 25° C. The gas is then drawn by an exhauster, by which it is delivered to the tar-extractor. After having been freed from the tar, the gas is led into the re-heater, where it becomes heated up to a temperature of about 60° to 70° C. The heated gas is then conducted to the saturator, in which the ammonia gas is extracted by direct absorption in sulphuric acid, and is recovered in the form of sulphate. The saturator is of the totally enclosed type, and the sulphate is continuously removed therefrom by means of an ejector working either with steam or compressed air. The salt is delivered on to a collecting table, and thence into a centrifugal dryer, where it is completely freed from mother liquor.

The products of condensation which are extracted in the cooling and tar eliminating operations are drawn off from the condensers, tar extractors, &c., and are conveyed into a separating tank, where the tar and ammoniacal liquor separate, owing to their different densities. The tar flows into one storage tank and the liquor into another. The liquor is pumped to the ammonia still, where the ammonia is driven off by steam and lime in the usual way. The vapours of distillation are conducted from the still and delivered into the main, where they mix with the heated gas, and the whole then passes into the saturator.

The heat necessary for liberating the ammonia in the stills and for reheating the gas after cooling and extracting the tar is generally supplied by means of the exhaust steam from the engines driving the exhausters. After the removal of the ammonia, the gas passes from the saturator and is conducted back to the ovens and other points as required.

It is important to note in this, and in all other direct-recovery processes, that if benzol is to be recovered it is necessary to cool down the gas after the extraction of the ammonia to a temperature approximately that of the atmosphere. In this cooling process any water vapour contained in the gas above the amount required to saturate it at atmospheric temperature is necessarily deposited. In the Koppers process, however, owing to the fact that the gases have already been cooled to atmospheric temperature, only a very small amount of liquor is deposited in this subsequent cooling. The following are typical temperatures at various points in a Koppers plant: After the coolers, 15° C; after the tar extractors, 20° C.; after the reheaters, 70° C.; after the saturators, 68° C.; after the final coolers, 15° C.

In direct processes which do not employ preliminary cooling, the whole of the water vapour contained in the gas is deposited in the cooling prior to the recovery of benzol. The liquor so deposited, however, is not of the same character as the effluent liquor which remains after the removal of the ammonia from the condensed ammoniacal liquor. The latter is always a troublesome product to get rid of; and it is one of the main arguments in favour of the modern direct-recovery processes that the quantity of such effluent liquor is either considerably reduced or entirely eliminated.

The Otto direct-recovery process differs from the foregoing in the fact that there is no cooling of the gas prior to the extraction of the ammonia. Consequently, there is no ammoniacal liquor to be dealt with, and hence no distillation; and the apparatus required for cooling of the gas is also eliminated. From the collecting main over the coke-ovens the hot gas is drawn into a tar-spray apparatus, by means of which a powerful stream of tar is directed into the gas; and this has the effect of precipitating the whole of the particles of tar suspended in the gas. The temperature of the tar-sprays is so regular as to completely remove the tar from the gas without condensation of ammoniacal liquor. The hot gas containing the latter in its vaporized form then passes through the exhausters direct into the saturator, where the ammonia is recovered as ammonium sulphate. This method of tar extraction is remarkably efficient; and the elimination of the cooling and distillation apparatus is a distinct step forward. It has to be remembered that wherever there is handling and storage of ammoniacal liquor there is bound to be some loss, not only on account of the fact of imperfect extraction, but also because of evaporation of the ammonia from the solution as a result of continued exposure to the atmosphere. The following are temperatures taken at various points in an Otto direct-recovery plant: Entering sprays, 94° C.; after spraying with tar, 75° C.; inlet to saturator, 74° C.; outlet of saturator, 85° C.; inlet to water-coolers, 79° C.; outlet of water-coolers, 39° C.

The two foregoing types of direct-recovery processes are typical of all systems now being worked; the difference between these and other systems being mainly in the nature of the apparatus employed. Certain factors must necessarily be considered in any study of the application of these direct-recovery processes. As has already been pointed out, the ammonia present in crude gas exists in the form of free and fixed ammonia. When cooling is employed, the fixed ammonia is dissolved out of the gas, and is obtained in the ammoniacal liquor, from which it is subsequently recovered by distillation.

In the non-cooling process, the fixed ammonia goes forward with the gas into the saturator, and, if present in any considerable quantity, would, if the process were not modified, have a deleterious effect on the apparatus owing to the production of hydrochloric acid gas, or the ammonium chloride would be deposited in the saturator and be mixed with the sulphate of ammonia. If this happened in practice, it would be a serious objection to this form of direct-recovery process. Knowing this, those responsible for the operation of the system have modified their process accordingly. In most cases where the fixed ammonia content warrants it, a small amount of liquor is allowed to condense. This is used as a solvent for the fixed ammonia, so that eventually the concentrated solution is obtained which can be worked-up into a marketable salt.

It is hardly a wise claim to make to say that no ammoniacal liquor is produced. If—and the writer knows of no such case—there were no fixed ammonia compounds in the gas, it would be quite a simple matter to carry out true direct recovery. But so long as any fixed ammonia is present, this cannot be converted into ammonium sulphate without the liberation of hydrochloric acid which, as already pointed out, is exceedingly harmful. Many

* For previous articles of the series, see *ante*, pp. 126, 174, 291, 336.

coals yield as much as 30 per cent. of their ammonia in the fixed state, so that the true direct process without modification is quite unsuitable for a plant dealing with such coal. The only alternative is to remove the fixed ammonia; and this can only be done by solution. A small amount of liquor is allowed to condense; but its temperature is kept fairly high while in contact with the gas. The liquor dissolves both free and fixed ammonia out of the gas; but, on account of its temperature, the free ammonia is again driven off, while the solution is concentrated in fixed ammonia. In effect, a semi-direct process (but without distillation with lime) is carried out, and the fixed ammonia recovered, not in the ultimate form of sulphate but as chloride—either solution or crystals according to requirements. The claim therefore that the direct process does not involve the production of any ammoniacal liquor can only be substantiated in hypothetical cases—*i.e.*, with coals which yield no fixed ammonia.

The question of the deposition of naphthalene also has some bearing on the working of a direct-recovery process. In those processes where cooling is employed, the naphthalene is almost entirely eliminated on account of such a cooling—being absorbed by the tar in contact with the gas. In the hot process, however, there is no deposition of naphthalene on account of cooling, although some considerable amount is removed by means of the solvent action of the tar sprays. On account of the high temperature, however, the removal is not complete; and it is found desirable for the extraction of ammonia, and before the gas is conducted to other portions of the plant, to wash out the naphthalene from the gas and recover it in marketable form. Such recovery is a well understood operation, and presents no difficulties whatsoever. It needs, further, to be remembered that in the hot process the volume of the water vapour is usually about the same as that of the gas alone, and account has to be taken of this in calculating the power requirements for the exhausters necessary to drive the gas through the various appliances. On the other hand, there is a tremendous saving of apparatus, and also of power necessary for the operation of pumps, stills, &c., for dealing with the ammoniacal liquor.

In the Simon-Carvès direct recovery process, the extraction of the tar from the hot gas is brought about by means of centrifugal apparatus. The gas passes from the foul main into a cyclone tar-separator—an apparatus having no moving parts, so that there is nothing to get out of order and no need for its duplication. The gas enters the apparatus at a tangent, with a velocity sufficient to give it the necessary cyclonic movement, and by this means the heavier tar is removed. The gas then passes forward to a dynamic tar-extractor, rotating at a high speed, which completely extracts the remaining tar. The clean gas, still hot and containing the whole of the ammonia salts, passes to the saturator, where the ammonia is then recovered as sulphate. Should it be required in connection with this process to recover ammonium chloride separately, a small amount of liquor is allowed to condense immediately after the dynamic tar-extractor. Another form of direct-recovery process, known as the Mont Cenis process, is employed by some firms of coke-oven builders.

The following description illustrates the direct process operated by the Coppée Company. The gas leaving the ovens is cooled down to about 90° Fahr. in the ordinary way, and is passed through a Pelouze and Audouin extractor for the recovery of the tar. It then passes directly into an enclosed lead saturator containing sulphuric acid, in which the acid combines with the ammonia to form sulphate. The small quantity of ammoniacal liquor produced by cooling the gas down to 90° Fahr. is distilled; the ammonia gas from it being passed into the gas-main immediately before the saturator. The heat produced by the combination of the ammonia and the acid in the saturator prevents any further condensation of vapour. The sulphate is ejected from the saturator, either by steam or compressed air, drained on to the draining table, dried in a turbo dryer, and conveyed mechanically to the sulphate store. The waste gases, consisting largely of CO_2 and H_2S, pass into the return gas-main, and are led to the ovens. One of the important advantages claimed for the process is that no re-heating is required after the first cooling of the gas, and therefore there is a saving in plant.

CHAMBER OVENS IN MEDIUM-SIZED WORKS.

Recognizing that, with the ever-increasing demand for lower priced gas on the one hand, and the rapidly increasing cost of manufacturing coal gas on the other, the gas engineer, especially in a medium-sized plant, must look for some means of bettering these conditions, Mr. H. W. Douglas, the Manager of the Washtenaw Gas Company, when called upon to put up new plant at Ann Arbor (Mich.), went fully into the possibilities of reducing the cost of production. After considering various carbonizing systems, he decided upon horizontal oven retorts, of which he lately gave the following description to the members of the Michigan Gas Association.

Three benches of ovens were built on foundations occupied by former benches of sixes; the foundation being slightly widened, so that it now occupies a space 34 ft. 9 in. by 13 ft. 10 in. Each bench consists of three ovens, 6 feet high by 12 feet long by 12 inches wide; and they occupy the same retort-house space as before—the only change in the building being that the back wall was removed. The ovens are heated by a standard type three-quarter depth furnace, having a grate area slightly larger than the standard; the grate being 31½ in. wide by 5 ft. 4 in. long. The heat travels from the combustion chamber to the top on either side of the central oven, passing over the top of the side ovens, and down on the outside to the recuperators, from which the waste gases are taken through a flue running at the back of all the benches to a chimney at the end. The height of the bottom of the ovens is the same as the lower retorts of a bench of sixes; and the total height above the floor of the installation is practically that of a standard bench of retorts.

The coal is put into the ovens through two charging-holes in each oven on the top of the bench, by means of a lorry carried on a track on the binding-bars, and running to the end of the stack of benches for its supply of coal from an elevated hopper. The coal is, before being elevated, crushed to about ¼-inch.

The coke is discharged from the ovens by means of an electrically driven pusher, running on a track of the old retort-house floor, into coke-buggies at the back of the bench, where it is to be quenched. As the coke is dumped into the ovens through the two openings, some means of levelling are required; and this is accomplished by a levelling-rake, operated by the same motor as the pusher. Doors on the front and back of the ovens are self-sealing, hung on hinges, to be operated by hand.

The gas is taken off the oven by a branch from the front charging-hole, where it is conducted by a short standpipe to the same hydraulic main which was used on the old benches, only reversed, so that the cleaning-pocket is on the front of the bench. In the rear of the benches, and above the waste-gas flue, a track carries a shoot to convey to the quenching cars the coke discharged from the ovens. At the side of the shoot is a platform, from which the operator may open and close the rear oven doors. The shoot car is propelled by hand-driven worm gear.

As the circulation of heat in the bench is quite different from anything which has heretofore been built, satisfactory heating is, of course, problematical. A standard 16-inch by 28-inch retort contains approximately 49½ feet of internal surface. Experience has shown in silica retorts that 400 lbs. of coal can be satisfactorily burned-off in five hours, giving a ratio of 0·0257 square foot per pound of coal carbonized in 24 hours; and these ovens, having an internal heating surface in each oven of 168 square feet, with a charge of 2600 lbs. of coal, have the following ratios for different length charges: For an eight-hour coking period, 0·0215 square foot per pound of coal carbonized in 24 hours; for a ten-hour coking period, 0·0269 square foot; and for a twelve-hour coking period, 0·0323 square foot. It will be seen that, for an eight-hour period, the heating surface is approximately that of a bench having known results, and that for a ten-hour and twelve-hour period it is greater.

Should the assumption that the ability to burn-off a charge is at all in proportion to the heating surface be true, there should be no reason why these ovens should not fairly carbonize their charge within the contemplated period. As to the exposure of the gas to the hot zone at the top of the oven, with a possible deleterious effect, the ratio of this area to the amount of gas passing through it is much less than in the ⌂ retort; and the upper part of the oven should be no hotter than the top retorts in a regular setting.

If the above results can be obtained, these benches will have a capacity of 128,700 cubic feet per day, based on the same yield as is obtained in ⌂ retorts, or, in other words, the capacity of a bench of sixes, which would occupy the same floor space, has been doubled. Should long charges be required, this capacity will, of course, be reduced; but even with a twelve-hour coking period, it would still be 50 per cent. greater than the old style.

The greatest improvement, however, is expected in the saving of labour. One man should be able to operate the pusher, opening and closing the front doors. One man will be required on the top of the benches, operating the charging lorry, and a third man on the back of the benches opening and closing the doors and quenching coke. This, with a fourth man for elevating coal and taking care of the coke, should be all the labour required per shift for sufficient ovens to manufacture from 700,000 to 1,000,000 cubic feet per day; and the work should be so arranged that only two shifts per day will be required, with probably three men on the second shift, or a total of seven men, against twenty-one men who are required to manufacture a less amount of gas in the present retort-house.

The King has approved of the award, by the Council of the Royal Society, of a Royal Medal to Dr. John Scott Haldane, F.R.S., for his services to chemical physiology. The following (among other) awards have been made by the President and Council: The Copley Medal, to Sir James Dewar, F.R.S., for his investigations in physical chemistry, and more especially his researches on the liquefaction of gases; and the Davy Medal, to Professor Henri Louis le Chatelier, for his researches in chemistry.

The second special factory lighting number of "A Thousand-and-One Uses for Gas," issued by the British Commercial Gas Association, contains some convincing photographs of installations of high-pressure gas lighting. Some of them, depicting the same factories under the two systems of lighting, enable very satisfactory comparisons (from the point of view of gas) to be made between gas and electricity. The chapter on the scientific selection of reflecting shades, with curves showing the distribution of light shaded and unshaded, will be useful to those who have to do with factory lighting.

THE OIL-WASHING OF GAS AND MATTERS ARISING THEREFROM.

A Discussion at the Southern District Association of Gas Engineers and Managers.

At the Meeting of the Southern District Association of Gas Engineers and Managers, at the Hotel Cecil, Strand, W.C., on Thursday last, there was a long discussion on the question of the oil-washing of gas. It was introduced by a written communication by Mr. W. Doig Gibb (the President), followed by some notes by Mr. H. O. Carr, of Wandsworth. The President's communication is given *in extenso*, and from that by Mr. Carr extracts are made.

The President's communication was as follows:

OIL-WASHING OF GAS FOR BENZOL EXTRACTION.

The only item remaining on the *agenda* is a general discussion on the question of oil-washing and matters arising therefrom. On the last occasion on which this subject was discussed, we had not the pleasure of having the representatives of our admirable Technical Press with us. At that time there were many doubts and fears as to what should or should not be said, let alone published; and it was decided to err on the safe side. Since then much has happened, and, weekly, it has been seen how discreet the Technical Press has been, and how any indiscreet remarks or statements made did not publicly emerge from the places in which they were spoken. If the Association were, by their attitude, so cautious as to have invited criticism, we are sorry, and the Committee take the blame.

We are gathered together to-day, not to lament that we are not connected with other industries which have materially profited by the war, not to grumble at the bad effect on our future business because our industry is all-important in producing necessary war material, but rather to get such information as will enable us to overcome difficulties, and so become more important units in achieving the common desire and aspiration of the great nation to which we belong. There is no greater or more important work to be done than the production of both benzol and toluol. Just as, in Ancient Egyptian times, bricks could not be made without straw, so in modern times successful war cannot be made without explosives.

For the manufacture of these in sufficient quantity, more and still more benzol and toluol are required. The largest production of these essentials can only be got by oil-washing the gas produced at the various works. The "Department of Explosives Supply" do not despise any serious effort in this direction, whether it be done in a home-made plant costing a few pounds, or in a large plant costing many thousands. The merit is gained by anyone doing all he can.

Details of the process need not be gone into by me now; for the activities of Messrs. Carr and Glover and their assistants, and Mr. Whitehead (an able assistant in the Department), to say nothing of such publications as those of Mr. Glover and of Messrs. Walmsley and Morfey, must have made these familiar to all who wished to be interererested. Other very instructive and interesting papers have been read to Associations; but they had reference to Government-owned plants, and probably the writers themselves will be the first to acknowledge the undesirability of too minutely and too publicly describing their design and working.

For such a discussion as is to follow, no text could be more appropriate than the recently published paper by Messrs. Walmsley and Morfey [see "Journal" for Oct. 31, p. 229].

Position of the Oil-Washing Plant.

Oil-washing should certainly be carried out after the gas is freed from ammonia, If not, there will be troubles from the deposition (in the wrong places) of ammonia salts, a consequent loss of ammonia, and a lowering of the benzol-naphthalene absorbing power of the wash-oil. Especially where "home-made" plants are in use, or to be used, the ideal position for oil-washing is after the purifiers. This position, as compared to the one between the ammonia scrubbers and the purifiers, is not a necessity; but if the latter, the condensing coil, &c., should be made of cast iron, as wrought iron is quickly acted upon by the combination of sul: phur impurities with the water vapours coming over with the crude spirit. This position also prevents any possible coating of the purifying material with the oil carried over in the gas. The oil-washing can be carried out in tower scrubbers or in mechanical washers (or parts of these) or in Livesey washers. The great point, as in ammonia washing, is intimate contact between the gas and the washing-oil. The oil used may be creosote, anthracene, or gas oil.

Dr. Colman's specification of creosote oil, as approved by the Department, is as follows:

Specific gravity	1020 to 1030 at 60° Fahr.
Tar acids	Immaterial.
Naphthalene	Should deposit no naphthalene on being cooled down to 55° Fahr.
Boiling point	Should not boil below 200° Fahr.
Distillation	Should distil not less than 70 per cent. up to 300° C. nor more than 90 per cent.

It may be noted that, owing to the demand, it is not always possible at present to procure oil to this specification, and the "nearest to it" may have to be accepted. As regards tar acids, Mr. John Bond's experiments (not yet completed) seem to indicate that they are probably better left in the wash-oil.

If gas oil is to be used, the required quantity of it should first be distilled and the resultant crude spirit be vaporized into the gas or otherwise disposed of; since it will contain too great a percentage of paraffins to be of much use for present purposes.

It may be assumed that an ordinary wash-oil will pick-up from 3 to 4 per cent. of its bulk in benzol, &c. This, of course, assumes that the requisite oil-washing plant is available for the quantity of oil used, and that the volume of gas is in proper proportion.

Taking the figure at 3 per cent. (and assuming a yield of 3 gallons per ton of coal carbonized), the quantity of oil to be circulated would be 100 gallons per ton of coal carbonized, or 75 gallons with 4 per cent. absorption. It is this small percentage of absorption which renders necessary a distilling plant at each works where oil-washing is being done. Unless in the most favourable circumstances, it would obviously not pay to send the benzolized oil to an existing distillery and have to get back about 95 per cent. of its original volume for re-use; and there would then also exist the necessity for providing more storage for both the benzolized and the debenzolized oils.

A small proportion of the wash-oil is carried over into the crude spirit. This has to be replaced, but at no real cost, as allowance will be made for it in the greater volume of crude spirit. It has not been found that the oil becomes "fatigued;" but small "refreshers" of new oil are advisable from time to time. A distilling plant is therefore required, by which the debenzolized oil can be treated to give off its lighter fractions as vapours.

Auxiliary portions of the plant must include means for cooling the debenzolized oil; for condensing the vapours of the lighter fractions; and also for separating the condensed water vapour from the others. Various manufacturers offer such plants; and the plants are simple enough to be made in gas-works themselves if there be any choice of scrap material.

The surface required for oil-cooling is far in excess of that needed for water-cooling; and insufficient oil-cooling plant has been the most prominent error in many of the earlier plants. The essential point is to start the production of crude spirit in the least possible time—an early, constant, and moderate production may easily be more valuable than an increased yield at a later period.

Difficulties Dealt with by Mr. Whitehead.

For the following notes of difficulties experienced in smaller plants, I am indebted to Mr. Whitehead:

Water in Oil (distinct from emulsification). This is due principally to the deposition of water from the gas or from condensation of steam in the still. It is, therefore, best to use the biggest tank available for the storage of the debenzolized oil, in order to give plenty of time to settle-out. Trouble may also occur when open steam is very wet or at low pressure, and may be to some extent obviated by superheating with gas-burners (or by leading the steam-pipe through the flues of a direct-fired plant). When the oil is much cooler than the gas, this trouble has been frequently accompanied by emulsification. It is advisable to maintain, where possible, a wash-oil temperature 2° or 3° Fahr. higher than that of the gas. This is also beneficial as regards naphthalene.

Emulsification is due to either: (*a*) Deposition of water from the gas and subsequent "churning" in the rotary washer, or (*b*) condensation in the still, owing to the oil-temperature not being sufficiently high. Emulsions are best got rid of by the heating-up of the oil in a separate tank.

Thickening of Oil, where the gas is free from tar-fog, appears to be due to the evaporation of lighter fractions of the wash-oil owing to the steam distillation. A specially light creosote may then have to be added to bring the oil to its original condition.

Naphthalene Troubles so far appear to be due to either: (*a*) Naphthalene picked-up by the gas from the oil. This has only occurred where the naphthalene content of the original oil was excessive (10 to 20 per cent. by weight, and where the temperature of the gas has been much higher than that of the oil. In cases where the wash-oil has contained only 5 or 7 per cent., very little trouble has been experienced. In fact, in many cases naphthalene has been extracted from the gas. In all cases, the use of open steam appears to reduce considerably the naphthalene in both gas and oil. Most of the crude benzol made with the aid of open steam contains from 5 to 15 per cent. of naphthalene. The open steam tends slightly to reduce the quality of the distillate, but the best results (both for benzol and naphthalene) are usually obtained when the total distillate consists half of water and half of crude benzol. (*b*) The extraction of naphthalene carriers, although the naphthalene content may be the same as, or less than, before. This is undoubtedly a great source of the trouble, and has so far best been treated by paraffin oil spraying.

Lack of Fractionation. This is particularly evident where tar-dehydration plants have been used for debenzolizing without any modification. The resulting benzol is of a poor quality, and

frequently priming of the wash-oil has taken place. A water-cooled column is too drastic for a crude plant, and would be better replaced by a fractionating column, lagged, and packed with iron rings or turnings.

Inability to Maintain Temperature. This only applies to steam-heated plants. In one or two cases it has been found that the valve regulating the steam supply to the closed steam-coils at the inlet to these coils would be better placed on the outlet, and thus keep full pressure in the coils.

Corrosion appears to be serious with hot benzolized oil, if much ammonia is present. Under these conditions, brass and wrought-iron cocks have been rendered useless in a few days. Cast iron apparently withstands this attack.

Air-Locks. Much trouble has been caused by faulty arrangements of heat interchangers, coolers, &c., in which no allowance has been made for the escape of air. In all cases the oil must enter at the lowest point and leave at the highest, unless air-vent pipes are carried up.

Mr. Gibb's Suggestion.

A proper rule seems to be to keep the temperatures of gas and oil well down—the former, if possible, being the lower of the two. When the crude spirit is produced, this can either be sold direct or it can be first rectified. I do not, however, propose to take up your time by enlarging on this latter phase, as it is easy to obtain information about it. Especially do I so decide, as, if you produce the crude spirit, the Government will see that the rest is done, although it may well pay to look into the question of doing it yourselves.

Returns Essential.

I might here interpose a remark directly bearing on crude spirit production. It is most essential that all deliveries of this should be at once notified to the department, giving details of quantities delivered, names of consignees, &c. The neglect on the part of many to comply with this request has caused the necessity for issuing the order which was noted in recent numbers of the "Journal of Gas Lighting" and "Gas World." It would indeed be an unfortunate occurrence if any gas engineer, after voluntarily starting oil-washing, were to be fined for not advising the proper authorities about the results of his national work. You may take it that it is most important to have accurate and punctual returns; for these form one link in a vast chain, and such a chain is only as strong as its weakest part.

Verticals and a Detriment.

I need only touch upon three more points. For present Government purposes (though it does not apply to general after-war conditions) the existence of too large a percentage of the paraffin series in the crude spirit is a great detriment. This condition is usually found in the crude spirit produced from "vertical" gas. It is advisable that engineers working with this class of retorts should first get a sample of wash oil, saturate it with benzols, &c., by passing gas through it, get this saturated oil distilled, and the resultant crude spirit fractionated by a competent authority. If the results be then sent to the department, they will be able to give advice on the subject.

Naphthalene Troubles.

Any remarks would be incomplete without some reference to naphthalene. Where many have studied the problem for twenty or thirty years, and where all have failed to produce a general remedy, it would be idle to pretend that, with the new process of oil-washing, everything is known about this worrying compound. Speaking in connection with oil-washed gas only—and in what follows I am really giving Dr. Colman's experience as well as my own—it would appear that the naphthalene content of the finished gas may vary according to the original percentage contained in the gas before it is oil-washed. Thus, if the original percentage be high, oil-washing reduces it; if low, it may be increased. This will depend on the temperatures of the gas and oil in the oil-washer—high temperatures giving greater amounts of naphthalene in the finished gas.

But in most cases the quantity of naphthalene in the finished gas is reduced by oil-washing. This, unfortunately, does not always mean fewer complaints; for the gas is also being deprived of its principal naphthalene solvents. In some cases, it has been proved beyond doubt that the oil-washed gas (comparatively free from naphthalene) must have been picking-up the older deposits in the mains and re-depositing them in the smaller and probably colder service-pipes. Such a condition would, of course, some day come to an end. It is, I consider, up against some of the larger gas undertakings, with their more highly-trained staffs and resources, to first devise the most efficient remedy to clean the mains and services from existing naphthalene, and then (or now) to determine the requirements of a gas which will not deposit the material in its travel to the burner. While brains are required to accomplish this, I would add patience as an all-important factor; for the process of "proving," under working conditions, is a slow, and maybe a heart-breaking, one.

But benzol must be got, and got now; and it is therefore suggested that, where there is trouble, or anticipated trouble, some solvent should be added to the gas to replace to some extent that which has been removed. The varieties and quantities of these are at present limited; and, in consequence, paraffin oil seems to be the best possible present medium. Vaporizing, under heat, has its advocates; but, personally, I favour blowing a fine mist of the oil into the outgoing gas. The mist must be as fine as ever possible; be put directly into the largest possible volume of outgoing gas; and be blown in the direction of the gas travel, and in such a position as will prevent the mixture of gas and oil mist from impinging too quickly on any solid substance set at an angle to its path of travel—T-piece, bend, crossover box, &c. From 15 to 20 gallons of oil per million cubic feet of gas should be sufficient, if used in time and continued in use.

The Position after the War.

The whole of my remarks have been based on the ever-increasing necessity for benzol; but it may well be asked, in the discussion which is to follow, what is the position going to be after the war? No one can tell; but the appearances all point to the fact that it is not going to pay to ever again put out the benzol with the gas. From an economic national point of view, this is undesirable; and if the Government recognize this, and will take the necessary steps, the problem can be easily solved.

It is not as if benzol were only used to form the base of explosives. It has great claims for power purposes, for the manufacture of dyes, and for many other purposes. And to some undertakings the cheap acquirement of a calorific standard may well make the outlay on an oil-plant a profitable investment.

Workers are Wanted.

As a last word, the department has found in the gas industry many workers, some talkers, and some who will do neither the one nor the other. Workers are wanted—men who can throw aside the usual preliminary looking for 10 per cent. sure and a possible 20 per cent.—men who will strain every nerve to help their country—and men who will face the necessary difficulties which every new process involves, and overcome them.

From Mr. Carr's communication, we extract the following:

NOTES ON OIL WASHING.

This is a war of "High Explosives" of which the basic materials are derived from coal alone. Gas-works and coke-oven works can therefore provide the "driving force" for the increased output of ammunition and guns necessary for the protection of our men, the destruction of enemy's forces, the advance into enemy territory, and, eventually, the winning of the war.

I have been asked on several occasions as to the smallest sized gas-works which could adopt oil-washing. The answer is, wherever it is possible, to do so. Large and medium-sized gas undertakings have their patriotic duty plainly staring them in the face. This does not, of course, refer to those undertakings which are already oil-washing or are materially progressing in that direction. To them all praise is due.

Small gas undertakings can not only be useful to the State by adopting oil-washing wherever possible, but also as bright examples to larger undertakings. As instance of small undertakings which are already oil-washing in the southern district, there are: Bordon, Hants, making 10 million cubic feet per annum; Petersfield, 20 millions; Godalming, 43 millions; and Farnham, 81 millions. Far too much stress is being laid by many concerns on such points as: Whether it will pay to adopt oil-washing; the disadvantages of oil-washing; and whether the plant will be of use after the war? Without hesitation all such questions should be swept aside. It is a matter of national safety.

By "clean" crude benzol, one means benzol containing little, if any, wash-oil. Certain crude benzols sent to distilleries contain as much as 25 per cent. of wash-oil; and if such oil is extracted at the rate of 2 gallons per ton, the real "clean" crude benzol is only 1½ gallons per ton.

One hesitates to mention the word naphthalene at this period of the year. It is a curious fact, however, that at our spring meetings the trouble, in the majority of cases, has disappeared. The best initial remedy for an enemy like naphthalene is "total internment" at the gas-works. At the Wandsworth works, it is found that by the joint use of the "C" process and oil-washing, no naphthalene issues from the gas distributed from the works. But still there are naphthalene complaints, due to the readiness of the naphthalene-free gas to pick up old naphthalene from the mains and re-deposit it in the cooler service-pipes. Oil-washing alone certainly reduces naphthalene; but it does not always eliminate it. It would seem, therefore, sensible to suggest that one or other of certain well-known systems of "oiling" the gas should be adopted, to carry the naphthalene to the point of ignition.

Some difficulties have arisen in regard to the working of debenzolizing plants. The admixture of sometimes 20 to 25 per cent. of wash-oil in the crude benzol can generally be avoided—especially should it be avoided, as it spoils the market value. In many plants the only outlet for the benzol vapours is at the top of the still. Benzol vapours should be conducted away to the condensing coil so soon as formed. They begin to be formed in the heat interchanger; they are present in large quantities in the pre-heater; and, of course, in large quantities in the still. These vessels should each have separate pipes to the vapour condensing coil, fitted with baffle-pots to keep back any wash-oil. The cold benzolized oil should be used as the cooling agent for condensing the vapours. It must be remembered that one has at least 40 gallons of cold oil to cool the vapours forming 2 gallons of crude benzol. Water is a dear material for the purpose, even if one has only to pump it. In the same way a large amount per annum may be saved in water economy in the debenzolized oil cooler. If one only ran length enough of piping, with plenty of air circulation, no water would be needed.

As to water in the debenzolized oil, this can only be avoided if the debenzolized oil is heated to a sufficient degree—say, not less than 110° C.—before leaving the still. Usually the bottom of the still is fitted with steam-sprays blowing through the oil to act as a carrying agent. If there is little (if any) pressure in the still, the expansion of the steam causes a decrease in the temperature of the oil, and to such a degree in some cases as to leave water in the oil. As a remedy, either the oil must be preheated, or, what is better still, a steam-coil under pressure fitted in the bottom of the still, so that, in spite of the action of the steam sprays, the debenzolized oil leaves the still at a temperature of (say) not less than 110° C.

As to fuel, if every means is taken of exchanging heat, and the plant is well lagged, 5 cwt. of coke per million cubic feet made, with 2 gallons per ton extraction, is a working figure. Lag everything, but don't lag behind in putting up your debenzolizing plant.

Now, as to continuing the oil-washing process after the war. An article in this month's "Cassier's Magazine" states that in 1914, 36 million tons of coal were used for the manufacture of gas and coke, 16 million tons of which were used for gas manufacture alone. Assuming the whole of the gas-works coal was subject to recovery at the rate of 2 gallons of crude benzol per ton of coal, and 4 gallons from coke-oven works, this would form 112 million gallons of crude benzol. But considering crude benzol contains toluol, solvent naphtha, and naphthalene, and coke-oven works are not all recovering crude benzol, and also that a large quantity of benzol is used in manufactures, as a rough estimate, 25 million gallons of benzol per annum, capable of use as motor spirit, is a high one of the available quantity for motor spirit just after the war. Cassier's gives the annual importation of motor spirit as 200 million gallons per annum. After all, it is seen what a small percentage can be available for gas and coke-oven works.

The importation companies are not likely to ruin themselves in trying to oust this quantity, but rather—as the London representative of one of the large companies told me—they would be glad to give a good market price for it and act as distributing agents. He recognized the fact that benzol recovery at gas-works was only a small part of their operations, and that the plants were capable after the war of being worked or not at the will of the gas undertakings. One important point for your consideration in respect of benzol recovery is that benzene is now a controlled price, and is much less than half its market value compared with petrol.

One final point for your consideration is the fact that up to the present coke-oven works with recovery plants using a less quantity of coals than that carbonized at all gas-works have turned out very considerably more explosive materials; and no doubt you will recognize a future danger to our industry in this.

DISCUSSION.

Mr. C. F. Botley (Hastings) said the difficulty of dealing with a matter of the sort before the members was that there were so many points discussed that one hardly knew where to start. He would first like to know whether it was proposed to publish the notes from Mr. Whitehead that the President had given them.

The President replied that personally he did not see the slightest reason why they should not be published; and he thought he might say that they would be available in the Technical Press. [They are published in the course of Mr. Gibb's communication, already given.—Ed. J.G.L.]

Information Wanted as to Difficulties Experienced.

Mr. Botley (continuing) said there must be many gentlemen present who had had actual experience of the oil-washing process; and they could help their fellow-members if they would tell them of some of the difficulties. In the district in which he was concerned, he did not feel inclined to light-heartedly invite his friends to go into a process which might land them in considerable difficulty. Personally, if he knew what were the difficulties before he started, he was prepared to take them up, and see them through. But he did want to appreciate exactly what were the difficulties, because they were generally aware there were certain difficulties which must be faced. As the members knew, he had had a little to do with naphthalene; and he could see, even in his own particular case, when naphthalene had been conquered for many years past, that with oil-washing he must go to extra expense in combating it. It was fair to assume that many other works would be in similar position. The principles underlying the processes for the prevention of naphthalene in the gas canalization had been very well stated by the President; and he (Mr. Botley) need not further refer to them, beyond emphasizing the fact that, if a naphthalene process such as that with which he was acquainted had been in use for a sufficient number of years, there could under normal conditions be no question of deposition in the canalization system. Consequently, the start of the oil-washing process could not result in the abstraction of naphthalene from the canalization, and the carrying of it forward as had been the experience in several places. There was also a suggestion that they should utilize both the tar-washing process and the oil-washing process as a means to overcome the naphthalene difficulty. He thought it only fair to remember that a great many who had used the tar-washing process had achieved a considerable degree of success with it. He was acquainted with a number of works where they were, taking benzol and naphthalene together, obtaining up to 7 lbs.; and they could only expect to get about 16 lbs. by the oil-washing process. Where they were doing this with the tar-washing process, it required a little consideration before one brought pressure to bear upon the gas managers to adopt another process which might land them in further difficulties. This was a question that wanted to be fairly faced, as well as that of the disposal of the product resulting from the oil-washing process.

The President observed that Mr. Botley seemed to think that tar-washing did lead to naphthalene trouble. He (Mr. Gibb) was sorry his experience had not been exactly the same as his; so that if anybody present who had been tar-washing had been seriously troubled with naphthalene, they would be glad to hear his experience.

Mr. Botley said he did not wish to convey any such impression. All he said was that it had been suggested they should use the tar-washing process as well as the oil-washing process as a means of combating the naphthalene difficulty.

The President admitted that he did not hear that remark.

No Two Questions about Oil-Washing.

Mr. James Paterson (Cheltenham) said he was proposing to put oil-washing into operation as soon as he could; but he thought that a few words on the point raised by Mr. Botley might be of help. Those among them who were committed to oil-washing should look upon themselves as missionaries, and try to convert the unconverted. Mr. Botley was aware, and he would perhaps agree with him (Mr. Paterson), that they could not judge of naphthalene, as to whether or not they had cured it, by twelve months' experience of any process. In other words, they adopted a process that was finally going to get rid of the naphthalene; it was not going to be completely operative within twelve months. As a matter of fact, his experience had been that he had had more trouble with naphthalene last summer than he had had for the last ten years at least. Whether this was going to be remedied by oil-washing did not enter into his calculations at all. There were various ways of dealing with the trouble; and members should not allow naphthalene to come into their calculations at all when considering whether they should adopt oil-washing. Oil-washing was necessary. They had all got to do it, and the sooner the better—naphthalene or no naphthalene.

Cooling the Wash-Oil for Removing Naphthalene.

He had been impressed by reading in the Technical Press the statement by a coke-oven manager that it was possible, by cooling the wash-oil, to get the naphthalene out of it. He did not know anybody who had tried it; but he was proposing in his plant to endeavour to effect this purpose. He did not know how far it would be successful; but he was told that, if the temperature of the oil was reduced sufficiently, the naphthalene that the wash-oil had combed-out of the gas could be abstracted, and the wash-oil on being returned to the washer would then take more out of the gas. He was going to try to do this. Fortunately, he had found a supply of cold water—he meant water at a low temperature—whereby he thought he might reduce the temperature of the wash-oil, and thereby get the naphthalene to come out as a sludgy mass. The cold water he found at the bottom of a gasholder tank. He conceived the idea of putting a minimum thermometer down the holder tank; and it registered 39° Fahr. He did not know whether this was a unique tank; but in it there was, as he said, water at a temperature of 39°. They had taken the precaution to syphon-out some of the water; and it then registered 41° Fahr. He was going to make use of this low-temperature water by putting a coil of wrought-iron tube down the side of the tank; and the wash-oil would be cooled by passing through the coil. He threw this out as a suggestion, because it proved this tank water could give a comfortable lowness of temperature. "Do not for goodness sake let us trouble about naphthalene," he remarked. "We have to get this crude spirit out of the gas. It is wanted; and we must do it." For dealing with the trouble, Mr. Botley had a certain process, which he (Mr. Paterson) had in use at his works; and he believed this would cope, and was now coping, with the trouble he was getting from naphthalene owing to tar-washing. However, he trusted it would be efficacious as time went on, and when his oil-washing commenced. Naphthalene must not be a bar to oil-washing in any way.

Introduce a Larger Quantity of Vapour than the Vapour Extracted.

Mr. W. E. Price (Hampton Wick) remarked that experience appeared to be very varied with reference to the success of tar-washing and with trouble from naphthalene. Probably this was to a great extent due to the temperature of carbonization. However, the question of naphthalene was likely to be with them—he hoped not continuously, but at any rate for a time, because in the oil-washing process the light vapours were taken out more than when the gas was not washed; and therefore the naphthalene that did exist in the gas was more likely to be troublesome than it would be under normal conditions. Therefore it looked as though a vapour of some description must be returned to the gas in rather larger proportions to compensate for the amount of vapour that had been abstracted in the washing process. Personally, he had had to suddenly drop the tar-working process, because he worked at rather high heats; and the effect was that his works' apparatus was blocked everywhere with naphthalene. He had no trouble with naphthalene in the district. This was because he had adopted the process of vaporizing, which was known to some of the members. This had been in operation for, he thought, at least seven years; and no naphthalene complaints were now experienced in the district. But those who might adopt such a process to

cure naphthalene must not expect to get rid of it, through the process, within a few hours of its adoption. It was at least two years after he had introduced the vaporizing process before he got any particular relief. He was now speaking in general terms. Relief was first obtained locally, and encouraged him to continue. But it was not until the naphthalene that was already in the mains had been dissolved and carried away that they were likely to derive relief universally throughout the district. And, having once got into that condition, it took a long time for the naphthalene to show again. It was a matter of experience. In his case, the vaporizing process was dropped for three months; and it was not until three months after that naphthalene began to appear again in the lantern cocks. But naphthalene was likely to be present under oil-washing; and the only way, in his opinion, was to replace in the gas the extracted vapours by the vapours of kerosene, or even a lighter oil than that, and in quantity larger than that of the vapours removed. Regarding the remarks of the President, he spoke of a fractionating column in the debenzolizing process. He, like Mr. Paterson, was immediately commencing the oil-washing process; and he was using a tar-dehydrating plant to debenzolize the oil. But in the plant (he believed this was unique) he had a fractionating column—a dephlegmator it was called—and the vapours from the oil passed first into this. It was filled with ferrules, and was lagged to keep it warm; and from there the vapours, which remained vapours, were conducted to an ordinary water-cooled coil. This fractionating column, as it was fixed, did too much work. It was intended to produce what might be called a heavy oil, compared with the light oil in the coil; but it had the effect of putting into the heavy oil rather too much of the light oil. Ultimately it was found better not to retain the ferrules in it. There was no doubt that, with an intermediate column of this description, the wash-oil could be kept freer of the crude light oils, and the light oils kept free of the wash-oil, than if a water-cooled coil only was used.

A Question of Conveyance by Rail.

One other point might be of help to some of the members. When the light oils had been obtained, they had to be disposed of, and sent to some destination. Now in most cases he took it the conveyance was by rail; and, as a hint and warning to some, he would like to say that there was likely to be trouble with some of the railway companies as to the transport of these light spirits. Some railway companies were more inquiring and more particular than others; and they might want to know what the material was that was being conveyed, and what was the flash-point. They might also require the sender to take all responsibility as to anything that might happen, after the material left the makers' works until it arrived at its destination. Seeing it was a very light material, this was perhaps a responsibility that some would not care to undertake. If such difficulties occurred, his advice was to refer the matter to the Ministry of Munitions. The Ministry were very anxious to do all possible to help those who were helping them; and they would find means of overcoming such difficulties. In most cases—in every case he should think—they would give a certificate taking upon themselves the responsibility of the conveyance of the oils from the maker to the buyer, and thus relieve them of a very great responsibility which one would necessarily think over more than once before incurring it.

After the War.

The conditions after the war were interesting to all of them; and they all he supposed had many views as to what was likely to happen. They had put up these plants in a hurry for the assistance of the conditions with which they as a nation were now confronted; and they hoped, when these conditions were removed, they would still have to use the plant for the same purpose. But the future did not appear to be very bright unless something was done by the Government to protect the home industry. Before benzol could become a universal product for motive power, the petrol industry had to be dealt with; and the petrol industry was not going to allow the benzol industry to oust it without considerable fight. Therefore it seemed that this was an occasion on which they should all combine and hang together, and show a bold and strong front, and tell the Government that, as they had done all they could for them and in the interests of the nation, they should make some return by doing all that they could to support the home industry, and to protect those who were producing benzol, which would be useful both for motor purposes and for the dyeing industry. If the Government would protect and support the dyeing industry, and do as he had suggested, then there seemed to be hope that the future would be a bright one for benzol producers. Otherwise, it might be the other way about.

Good Experience at Bournemouth.

Mr. P. G. G. Moon (Bournemouth) said he was sorry to hear Mr. Botley at this stage asking if oil-washing was going to present insuperable difficulties to anyone undertaking it. As far as their experience at Bournemouth went, he could say definitely there were no difficulties that a man of Mr. Botley's initiative and capacity could not easily overcome. As on Mr. Botley's own showing, the introduction of the oil-washing process increased the output of the required raw material from 7 to 16 lbs. per ton of coal, it was a process that was well worth undertaking. They had been oil-washing at Bournemouth for the last ten months; and they were having no difficulties with naphthalene; and they had sent away some 70,000 gallons of crude benzol from about 55,000 tons of coal. They had tried the "C" process; and they had had a few difficulties with naphthalene. When they passed on to creosote-oil washing the naphthalene difficulties became fewer, and had now disappeared altogether. The difficulties, such as they were, could quite easily be dealt with on the district by any of the well-known methods now obtaining. Those who had secured the absence of naphthalene with the "C" process might be certain they would have no trouble with the oil-washing process. It was largely a question of the balance of the gas and oil temperatures during the process of washing. If they got these properly regulated with either process, then they obtained fairly satisfactory results with the "C" process, and absolutely satisfactory results with the oil-process. If these elementary precautions were neglected with either process, trouble would ensue. He hoped Mr. Botley would go away feeling there were no difficulties that ought to hinder him putting in hand a proper oil-washing process, and advising other engineers in his district, who might still be delaying in making up their minds, to go and do likewise.

Mr. Botley asked that it should not be understood that he was against oil-washing. He was going to commence the process himself. All he wanted to do was to elicit information to assist others in his district.

The President said he knew Mr. Botley was out-and-out in his desire to help the Government. But if he would allow him (the President), as an old friend, to say so, his remarks really rather conveyed the idea that he had not seen his way to recommend oil-washing on account of unknown difficulties in the path that he himself had yet to pursue. He (the President) was well pleased to have Mr. Botley's explanation that this was not so. Going to the hunting-field for illustration, one would never win a steeplechase by going round each hedge to see where one was going to land. [Laughter.]

Mr. Botley said he thought his purpose would be achieved before the discussion ended.

Government Protection Required against Local Authorities' Objections.

Mr. T. N. Ritson (Chichester), referring to the opposition of local authorities in connection with calorific power applications under the new Act, asked why the Government did not protect gas companies, and then everyone of them would go in for benzol extraction. If gas companies in this matter were of use to the Government and the nation, then let the Government see that the local authorities did not humbug and deter the companies by their objections against the calorific standard. The Government should without any further demur give the gas industry the benefit of the calorific standard; and so encourage them to adopt benzol extraction without having to contest the matter with the local authorities.

Compulsory Benzol Extraction.

Mr. D. H. Helps (Reading) said some of them had heard of vague threats as to obtaining coal if they did not adopt the oil-washing process. They had also been told that there would be no difficulty with naphthalene if oil-washing were adopted, and that there would be no difficulties in obtaining the calorific power standard.

The President: These are general statements; and we should be glad if you could give us some definite information where they came from.

Mr. Helps said he would be pleased to give the President the information after the meeting. In a report he had presented to his Directors on the subject, he had stated that there would be none of these difficulties; and he would have to withdraw both statements. They knew what happened in the case of Sheffield. He thought that gas companies ought to have it in black and white from the Board of Trade or the Government as to what they were prepared to do. There was no question about the paramount importance of washing for benzol. Mr. Carr said that everything must be swept aside—all difficulties with regard to naphthalene, &c.—to get benzol; but he (Mr. Helps) did not think it ought to be left solely to willing individual undertakings. He thought benzol recovery ought to be made compulsory. He agreed that a volunteer was better than a pressed man; he also agreed that it would be most desirable if the whole industry went into this voluntarily. But the possibility was that a number of undertakings would not; and those who did would suffer because of this. He should never contemplate cutting-off a limb of their big giant by practically denuding gas of its illuminating constituents; and they must in this particular matter sweep aside the patriotic side. ["No."] If they reduced the gas to a very low point in respect of illuminating power, it was probable there would be no difficulty with naphthalene. He agreed with that. He also agreed with what Mr. Botley had said. He should like to ask Dr. Colman whether he thought that, washing gas of the constituents which helped to hold-up naphthalene, it was likely that gas was going to pick-up naphthalene in the district. In connection with steam, he inquired if any one knew of a convenient form of superheater. In some cases where they wanted to adopt oil-washing, there might be little steam-power; but by means of some simple coke-heated superheater, it might be possible to use existing boilers.

Small Undertakings Have No Money to Spare to Meet Opposition.

Mr. P. P. Channon (Haywards Heath) said he could advance a specific case. He had urged oil-washing upon his Board for some time past; and he had also urged upon them to take up the matter of applying for a calorific standard. The reply was that, when a large town immediately to the south applied for the calorific stan-

dard, they were very strongly opposed; and until his Directors saw the result of the opposition, they must let the matter drop, as they had no money to spare at the present time with which to meet opposition of that sort.

Representations as to Compulsory Washing.

Mr. R. Beynon (Torquay) asked whether it would carry weight if they as a body of gas engineers expressed the opinion, and conveyed it to the proper authorities, that oil-washing should be made compulsory. He would, if necessary, propose a resolution to this effect, with the greatest pleasure.

The President remarked that perhaps he might give his opinion on the point at once. If they had known at the beginning of the war all they knew now, there was no doubt whatever that compulsion would have been the correct thing. But they had travelled through two-and-a-half years of war picking up education the whole time. He conceived that it would be very much more difficult now to make a compulsory order than it would have been at the beginning of the war. ["No, no."] He meant that it would be more difficult now to do it than it would have been at the early stages. Of course, he could only give his individual opinion. If it was the opinion of the meeting that a request should be conveyed to the proper authorities, he thought it was quite right it should be done. He would not attempt to prophesy as to the result; but he did say, from his own experience from day to day, how complicated such a problem became the longer it drifted without something having been done right from the start. The ramifications got so enormous that it was not just a question of issuing an order in so many lines. With this expression of opinion, he ruled that it was within the province of the meeting, and the members were certainly entitled, to make representations if they so chose. But he was not sure that he could even advise them as to whom representations should be made at the present time.

Work for the National Gas Council.

Mr. Helps: How would it be if the National Gas Council were approached on this question?

The President said he believed there was a Committee meeting the day before of the National Gas Council, when rules were passed. By these rules, if they obtained a certain number of the members of the Institution—if he remembered rightly, twenty—the National Gas Council could be requisitioned to take up any particular question of general interest.

Mr. Helps: Would a requisition from this Association be sufficient?

The President said the Council had been about twenty months getting started; and it might be twenty months before any useful work could be done. The Council had, in the first place, one or two very large and intricate problems to settle.

Mr. Ritson asked whether the Government was beginning to appreciate the value of benzol, and that it could only be obtained through gas undertakings and coke-oven plants? If gas companies were to be of help to the Government, the Government must come to the rescue of the gas companies. But what was happening? Take the Sheffield and Brighton Companies, they were both opposed by the local Corporations. If the Government valued the benzol that the gas companies gave them, they ought not to allow this sort of thing. In his small works, his plant only wanted re-organizing to be in readiness for the extraction of benzol. But he was afraid of the Corporation; and he was not afraid of admitting it. Gas companies should not be put in the position of being humbugged by the local authorities.

Back to the Need.

Mr. W. N. Westlake (Exeter) said they were drifting into a little unfortunate position. He quite sympathized with the suggestion that had come from several members, that it would have been preferable to have had a compulsory order for oil-washing at the start, instead of merely a request from the Government. He thought that even now if they could get it, it might be a very useful measure. But what was to happen in the meantime? If this matter was going to the National Gas Council and then on to the Government, this was going to take time; and time was valuable. If some of his friends would allow him to say so, he fancied they were still living in the year 1913. They must not forget that the country was at war, and that to win the war was the paramount thing for Great Britain. It was the gas industry that could help to this consummation, and the gas industry ought to help quickly—not delay. Were they going to face the situation? After this "job" was over, if anyone could say that, owing to delays on the part of gas undertakings in adopting the recommendations and the requests of the Government, and not yielding to the pressure that was brought to bear, the war was prolonged, and so many more lives lost and so much more money spent and so much more misery caused, then "shame" upon those undertakings. They wanted to bring the matter back to that. This was the question they had to consider now. Did they get trouble from tar-washing? Of course, they did, and deliberately faced it. Were they going to get difficulties with oil-washing? He had not started yet at Exeter, but he hoped to directly he got back. Then they were simply going to face any difficulty that arose. They were taking up oil-washing because it was absolutely necessary, and because they wished to give the Government to the extent of their power what they wanted to win the war. Pass a resolution if they liked to the Government or to the National Gas Council to have oil-washing made compulsory. But he urged that they should take the right and quicker course of adopting oil-washing voluntarily. If they suffered—even suffered some permanent loss of business (and he was not sure the undertaking with which he was connected had not suffered some permanent loss of business, because they had done what they had)—then it would be something to glory over after the war.

Wash-Oil and Water in Benzol.

Mr. F. W. Cross (Lea Bridge) said he should like to come back to the President's remarks on a point of practical importance. It was evident that there were a large number of works that had not yet gone in for oil-washing; and the engineers of these works would be looking out for the best kind of debenzolizing plant with which to carry out the work. The President spoke of the amount of wash-oil that was in the benzol, and, he thought, the amount of water as well. The amount in one case was 25 per cent. in the benzol after being distilled. Mr. Carr had referred to a process of taking off the benzol even so far back as the oil pre-heater, then coming to the steam-heaters taking off still more benzol, and the remainder he presumed in the still. Would this process of Mr. Carr's free the benzol from wash-oil and water more so than the 25 per cent. foreshadowed by the President. [The President remarked that it was Mr. Carr who mentioned 25 per cent.] However, if that was so, such points should be circulated to let producers know them, so that they could get the best kind of apparatus. Bearing upon the point as to the action of the local authorities and the Government, there was responsibility attaching to applicants for a calorific standard in respect of any opposition that might be offered. There was considerable expense and considerable trouble; and he really sympathized with those who had to bear the expense and trouble. In his own district, the local authorities had not opposed the Company; and therefore he could heartily sympathize with those who had to meet hostility. He contrasted the difference between an ordinary Bill in which there were many provisions with this application for one thing only—a calorific standard. In the former, there were matters which, if there was opposition, they could drop; but there was only one thing that could be dropped in the calorific standard application. He should like to know whether, on an application for a calorific standard, if there was much opposition by the local authorities which might lead to great expense, a company would be allowed to drop their application.

Could Not be Foreseen.

Mr. D. T. Livesey (East Grinstead) said, with reference to the point raised by Mr. Helps, it seemed rather to drift from the question before them, because, when the war commenced, there was no idea of washing the gas by oil; and then no one could have expected the Government to foresee the future sufficiently to warrant them making either tar or oil washing compulsory. And he thought members were rather out of it in suggesting now, when they had found out it could be done, that the Government should have made compulsory something at the beginning of the war.

Mr. Helps said he did not suggest that.

Local Authority Applicants for a Calorific Standard.

Mr. Livesey said he should like to ask whether it was not a fact that up to the present about thirty companies and eighteen local authorities had applied for the calorific power standard. As far as he knew, with the exception of Sheffield, there had been no real decision in the matter; and he did not see that they could blame the Board of Trade for not supporting the gas companies when there had been no decision against the companies. In his own case they had applied for the calorific power standard; and he received from the Clerk to the District Council an inquiry as to what was the calorific power of the Company's gas before the war as compared with the 500 B.Th.U. for which they were now asking. He told the Clerk that, so far as the Company were concerned, there had never been a calorific power test made before or since the war; but he was able to say that 500 B.Th.U. was the standard which was being asked for by the municipal councils and urban authorities who possessed gas-works. In this fact he (Mr. Livesey) thought they had a very strong argument against any opposition. If municipal authorities and urban councils were asking for this standard, there could be no harm in granting it to private companies; and this, in his opinion, supplied them with a strong point to their case before the Board of Trade.

No Complaints at Norwich.

Mr. Thomas Glover (Norwich) said he was reminded by the discussion of a cartoon that recently appeared in "Punch," where an Irish soldier was remonstrating with a civilian for not joining up; and the civilian said: "Well, I would willingly go if they would compel me." This seemed to be the attitude of a great many people with regard to the oil-washing of gas—they would willingly do it if compelled. This was the attitude of a great many men with regard to the Army; but to the glory of the British nation, they had raised 5 million men by voluntary methods. Was it going to be to the disgrace of the gas industry that they only got a few to oil-wash by voluntary means, or were they going to wait for compulsion? Were they going to talk about it for ever, or were they going to do it? It was simple timidity, want of heart, and want of pluck that were keeping a lot of people back. If they would only "buck up," and adopt oil-washing as quickly as possible, all their fears would disappear. In this country, he was sorry to say, they very often adopted haphazard methods; and this was so in the case of the gas industry in providing the Government with what they required. It might be that they had a

Government who did not foresee very much; and they did not see they would want benzol and toluol for explosives. It was a pity it was so. Now they had realized it, surely it was their duty to take the most direct and reliable course of providing what was needed. With tar-washing his experience had been they had a gain of ½ lb. of toluol and about 1 lb. of benzol; while with oil-washing they could multiply the benzol by nine, and the toluol by four. That was to say, they could by the oil process provide nine times more benzol and four times more toluol. They were at Norwich getting 3 gallons to the ton, and were not suffering from any of the difficulties that had been talked about that afternoon. They had no complaints, or none that they were afraid of. Such as they were, they were overcoming them by putting in incandescent gas-burners where there were a few lingering flat-flames, or better flat-flames where there were cellars or insignificant sort of places that had to be lighted by such burners. He did not think he had much more to say. He had previously said and written what he thought was necessary to spur on interest in this matter; and if any of the members cared to go to Norwich, he would show them a system of oil-washing which worked like a clock. It had been systematized and controlled to such an extent that it was almost perfect in its operation. The quantity of oil passing through the plant was measured by an accurate meter; and the registration was recorded every hour. The quantity of spirit made was carefully measured. The temperatures were also carefully measured every hour at every point of the plant; and so they knew exactly what they were doing. He recommended to members putting in an oil plant not to feed the plant direct from a pump, but by gravity through a cock provided with quadrant and pointer, so that they could regulate exactly what quantity of oil was passing through not only the washing plant, but the distilling plant. They should take care, too, to have the temperature at the inlet of the still well above the boiling-point of water, as well as at the outlet of the still. They would have little trouble then with water in the oil; and the oil for absorbing benzol and toluol would keep its quality. If any of the members wished for more particulars, and would do him the honour to visit Norwich (where they had accumulated a considerable amount of information), he would be glad to give them what they required.

Oil-Washing and Naphthalene.

Dr. H. G. Colman (London), invited by the President, said there was very little he could add to the excellent summary prepared by the President and the notes by Mr. Carr. They covered the ground very thoroughly. Naturally some of the members would like a little more detail; but it was impossible to go into detail at a meeting like this. A point he would especially mention was as to naphthalene. It seemed like old times talking of naphthalene. He had been on his legs many times in that very room talking of naphthalene; and he did not think the position that day was really altered in principle from what it was then. He thought there was no question that, provided they had enough suitable solvent for the naphthalene in the gas to travel along to the burner, they would have no naphthalene trouble. This was all right in principle. But the trouble was to ensure this condition taking place; and it was because the condition was not always ensured that naphthalene trouble came about. In regard to oil-washing —and the same thing was true with regard to tar-washing—the result was that simultaneously with the stripping-out of the benzol and the toluol, they removed from the gas the heavy naphtha vapours which they wanted to keep in, for they were the ones that were necessary to act as solvents of the naphthalene. That was to say, if the naphthalene came down in the mains, the naphtha vapours came down along with it; and the two formed the liquid which went to the syphons, and they did not cause any trouble. It might be taken as certain in the great majority of cases where they used oil-washing, even though they would mostly reduce the quantity of naphthalene found in the gas, they would reduce the solvents in still greater proportion; and in any naphthalene trouble it was most essential that solvents of some kind should be added to the gas. They could be added, as had been stated, in a great many different ways. They knew of the work that had been done on the point by Botley as well as by Young and Glover; and it was on a process that followed on their work that the thing could be carried out. There were many solvents that could be used. There were the heavy naphthas themselves, and "solvene" and that type of thing were all valuable if sufficiently free from naphthalene. But at the present time the only thing that was easily obtainable was the ordinary kerosene oil, which could be procured practically anywhere in the country without difficulty. When this was put into the gas in the form of spray as the President said, or when it was evaporated into the gas by passing a small stream of gas over a heated surface over which the paraffin flowed, either system could be successfully adopted, provided that the arrangement was such that the surplus of the paraffin which the gas would not hold as vapour came down in a fine mist—then the naphthalene difficulty was overcome. But, of course, it was essential that the paraffin which was there not in a vaporous condition, but in a liquid condition, should be in an exceedingly fine mist; and if the conditions were such that the mist was not formed, it was apt to fall out of the gas, and not carry to the extremes of the district, then they might have the naphthalene trouble even then. It was really a question of so arranging the introduction of the paraffin into the gas, whether mechanically or by heat, that they got it formed into a fine mist. There was another point. In one or two cases where paraffin had been used, it had not been eventually successful. This arose from mechanical reasons—viz., that the mist produced had not been fine enough to carry. He knew of a number of cases where paraffin had been introduced with complete success. As Mr. Price had said, when once they had naphthalene in their mains and services in the district, it might be a long time before it was completely cleared out, and trouble ceased. When once it ceased, it would not recur even when oil-washing was carried on, providing the condition he had mentioned was fulfilled. This, of course, involved a certain amount of expense. The paraffin had to be paid for; but it did not seem to him that it should be looked upon as an oil-washing expense. It appeared to him, too, that the provision of some apparatus for adding naphtha vapours to the gas was an essential provision in practically every gas-works. Even if they were free of such a condition as naphthalene trouble at the present time, they did not know how soon there might be an alteration in the conditions of carbonization or of the coals that were being delivered (which, apart from oil-washing, had had considerable influence at the present time) that would result in naphthalene trouble. Another mistake made in connection with the addition of paraffins or solvents was to defer the application until the time the naphthalene trouble was in existence; it ought to be made long before the trouble came about. The use of the solvents should be continued regularly throughout the year. If they stopped-off, they might not get trouble immediately, but two or three months later. The mischief was often done in the hot weather; but the real trouble might not appear till the autumn of the following year, and then the naphthalene that had been deposited in the larger mains was picked up again and carried to the services, where it was exposed to a lower temperature. The use of solvents should be started simultaneously with the washing; otherwise they might get into trouble. One other point in connection with what Mr. Paterson had said. He suggested that he was going to try to cool the wash-oil so as to get as complete removal as possible of the naphthalene in it. The argument that it had been tried successfully with coke-oven gas was not one that could be carried to coal gas. In the case of coke-ovens, after the gas was washed with oil, it was scarcely stored at all but was immediately burned in the ovens, and the surplus was run through large mains and services for other purposes. It was a totally different thing when they had a district extending over a large area and the gas being supplied through an intricate network of large and small pipes; then the naphthalene in gas which did not give any trouble under coke-oven conditions might do so. They must judge as to what would happen in connection with coke-oven gas, and what would happen in connection with the product of gas-works. Still another matter arose to some extent out of the points which Mr. Whitehead supplied to the President. He (Dr. Colman) had been asked as to the use of Wilton's dehydrating plant for debenzolizing the oil. This plant, excellent though it was in getting rid of water out of tar, was not so useful for debenzolizing. But a coil could be used for preheating the oil; and by means of a simple column still, which anyone could construct for himself, the crude benzol could be got out of oil which only contained in it about 15 to 20 per cent. of the wash-oil. If any member wanted further information about it, he would be happy to give it, but he could not then go into details.

This concluded the interesting discussion.

REMOVAL OF SULPHUR FROM SPENT OXIDE.

By Edward J. Murphy, Assistant Chemist to the Brooklyn Union Gas Company.

[A Paper submitted at Last Month's Meeting of the American Gas Institute.]

In the utilization of bye-products obtained from the manufacture of gas, practically all of them have come into some use except spent purification oxide. This material is considered in general to be a waste product; and having done the required work, it is thrown on the refuse heap—especially that used in carburetted water-gas purification. While the costs involved in gas purification are not the largest in gas manufacture, it nevertheless occurred to the writer that if the free sulphur in spent oxide could be removed economically it could be used again for purification purposes, instead of being thrown away.

It has been shown by Pelouze* that distillates from coal tar dissolve considerable amounts of sulphur at a temperature approaching their boiling-points, while at ordinary temperatures only a small percentage is dissolved. The absorption of sulphur occurs notably with the heavy oil distillates (200° to 300° C.). Recently a patent was obtained in France for the extraction of sulphur and nitrogen from spent oxide.† In this process, the patentees use coal-tar distillate heated to 100° C.; the minimum boiling-point of the oil used being somewhat higher.

As water-gas tar was all that was available to the writer, it became necessary to determine whether distillates of this type had the same property of dissolving sulphur. Accordingly, a large

* "Comptes Rendus," Vol. LXVIII., pp. 1179-80; Vol. LXIX., pp. 56-57.

† See "Journal," Vol. CXXV., p. 29.

sample of water-gas tar was distilled up to 225° C., and then re-distilled and cut at the following temperatures above 150° C.

Temperature °C.		Specific Gravity at 20° C.
150–160	..	·8692
160–170	..	·8743
170–180	..	·8843
180–190	..	·9023
190–200	..	·9145

Each of these fractions was then treated with an excess of pure sulphur, and slowly cooled to 20° C. The sulphur crystallizing out was filtered off, and that remaining in solution was determined.

TABLE *Showing the Solubility of Sulphur at 20° C.*

Distillate °C.		Grammes Sulphur in 100 c.c. Distillate at 20° C.
150–160	..	2·60
160–170	..	2·69
170–180	..	2·80
180–190	..	2·94
190–200	..	3·33
150–200	..	2·74

These results are almost identical with those of Pelouze, who used coal-tar distillates.

Extractions were then made on some of the coarsely ground spent oxide, using a Gooch crucible in a Ford-Wiley-Soxhlet extractor, and a paper cartridge to hold the oxide. In order to obtain results that were comparable, each sample was extracted for 45 minutes with the distillate. The crucible was then withdrawn, and the oxide washed twice with toluene, three times with ether, dried at 105° C., and weighed. The results are tabulated:

Distillate °C.		Per Cent. Extracted, Sulphur and Tar.		Per Cent. Sulphur in Extracted Sample.
150–160	..	53·35	..	7·40
160–170	..	54·93	..	6 98
170–180	..	55·97	..	6·30
180–190	..	56·32	..	5·92
190–200*	..	56·39	..	6·11

* As the temperature approaches 200° C., sulphuretted hydrogen is very noticeable.

The original oxide contained 52·15 per cent. of total sulphur. Only the result of one extraction with each distillate is shown, as the above sample is a fair average of all that were treated.

For the purpose of showing the performance of an extracted oxide, with respect to its fouling properties, large samples of oxide and correspondingly large amounts of the entire distillate (150° to 200° C.) were used. The oxide was first air dried, not ground; and the extraction was made in apparatus consisting of a simple tin percolator containing a fine wire-mesh sieve and a piece of muslin, which is necessary to prevent the iron oxide from running through with the oil, after its removal from the percolator. The oil and oxide were mixed together and heated to 100° C., and this temperature held for five minutes. The oil was allowed to flow out by a cock at the bottom of the percolator, and cooled.

After cooling, the extracted sulphur, which crystalized out very readily, was then filtered. The oil was used again for a second extraction on the same oxide. Each oxide was extracted twice, and finally freed from oil by passing slightly warmed air over it. In the results shown below, extractions were made with water-gas tar distillate (150° to 200° C.); and the fouling tests were done according to the Kuneberger method.

Sample.	1	2	3	4	5	6
Oxide, grammes . .	100	100	200	500	500	500
Distillate, c.c. . . .	300	300	500	1500	1500	1500
Sulphur remaining after extraction, per cent.	6·46	6·48	7·11	6·90	7·54	6·26
Sulphuretted hydrogen Absorption.						
Change 1	12·54	15·00	22·43	16·41	18·09	13·51
Change 2	12·79	13·05	20·00	15·12	15·02	13·10
Change 3	14·83	12·01	11·18	11·44	14·02	14·65
Change 4	8·71	10·40	6·27	9·20	11·76	11·21
Change 5	7·86	8·21	4·11	7·41	8·12	7·72
Change 6	8·89	6·46	4·25	5·05	3·04	6·21
Change 7	5·45	4·09	3·61	5 12	2·02	2·86
Change 8	2·11	1·48	0·42	3·12	0 77	1·01
Change 9	1·87	0·63	0·61	3·00	1·12	0·59
Change 10	0·92	0·72	0·33	2·46	0·91	1·19
Total	75·97	72·05	73·21	78·33	74·87	72·05

By the results shown above, it can be seen that the avidity for hydrogen sulphide of an oxide after being treated compares favourably with any good oxide. It might be stated here that all the samples treated were precipitated oxides. It is also to be noted that the percentage of unextracted sulphur is a practically constant figure. Just how many times a spent oxide could be treated and used, the writer is not ready to state. Lack of time prevented the working out of this important point.

It must be borne in mind that the results given are all made on a laboratory basis; and, of course, not much can be said, at this time, of the economics of the process. The various costs for apparatus, labour, &c., have to be taken into consideration; but the material necessary for the extraction is to be found right in the works. This can be used over and over again. It is only necessary to redistil the oil when the amount of tar, which is also extracted with the sulphur, becomes troublesome.

The writer hopes to be afforded the opportunity to try the process on a working scale, as it is believed to offer possibilities The paper is submitted as a suggestion for the economical use of a material which at present is of comparatively little value.

THE EQUIVALENT OF THE OBSERVED HEAT VALUE OF THE LIGHT OIL SCRUBBED FROM COKE-OVEN GASES.

By J. W. SHAEFFER, Manager of the Milwaukee Coke and Gas Company.

[A Paper presented at the Eleventh Annual Meeting of the American Gas Institute.]

IN preparing this paper, inquiries were sent to thirty bye-product coke plants throughout the country which manufacture nearly one-half of the total bye-product coke-oven gas in the United States. These thirty plants include the various types of ovens and many different kinds of coal, so that the information is thought to be representative of the coking practice at the present time in America.

The results of the inquiry have shown that the loss in B.Th.U. of the gas as indicated by calorimeter tests due to scrubbing-out the light oil is only slightly greater than the heat value of the light oil removed.

THE HEAT EQUIVALENT.

For these calculations, the heating value of light oil was determined by calorimeter tests, and found to be 17,400 B.Th.U. per pound of liquid light oil. To this was added the latent heat of vaporization of benzol, 167 B.Th.U. per pound, as calculated from Smithsonian Physical Table No. 234. The heating value of the light oil, *plus* the latent heat of vaporization, gives 17,567 B.Th.U. for the gross heating value per pound of light oil vapour. This value is considerably lower than the corresponding value for pure benzol, which is 18,793. This is accounted for by the presence of carbon disulphide and other impurities, which have a comparatively low heat value. The latent heat is added, in order to make the calculations comparable with calorimeter tests in which the light oil enters the calorimeter in the form of a vapour.

In determining the actual loss in heating value due to scrubbing-out the light oil, calorimeter tests were made in the usual way on the gas before and after the scrubbers. The difference in B.Th.U. divided by the B.Th.U. of the gas before the scrubbers gives the percentage of actual loss. The calorimeter tests are understood to be the gross B.Th.U. values.

The B.Th.U. per cubic foot of the gas after the scrubbers was calculated as follows:

$$\frac{a - 121{,}827b}{1 - 35b}$$

Where a = The B.Th.U. per cubic foot of the gas before scrubbing.

b = The gallons of light oil removed per cubic foot of gas.

35 = The cubic feet of vapour per gallon of light oil.

The constant 121,827 is the product of 17,567, the B.Th.U. per pound of light oil, 7·3, the pounds per gallon of light oil, and 0·95, a correction factor correcting for the amount of absorbing oil in the light oil. The amount of absorbing oil is assumed to be 5 per cent. This figure varies considerably under various operating conditions; one plant reporting as high as 10 per cent., others have only 4 per cent. The average of all calculations shows a theoretical loss of 4·45 per cent.; while the actual loss determined by the calorimeter tests at these same plants is 4·62 per cent.

For a plant where the light oil is removed with a fair degree of completeness, these figures will be considerably higher—about 5·8 per cent. The above averages are low, on account of their including plants which were scrubbing with a comparatively low efficiency.

Theory *versus* Practice.

These figures have shown that the actual and theoretical losses agree within the limits of probable error in calculation and determination. In contradiction of these facts is the belief of many gas engineers that the actual loss due to scrubbing-out the light oil is much greater than the calculated loss.

This belief is based on observations, rather than on tests or calculations. The observed loss due to scrubbing the light oil out of the gas is likely to be considerably greater than the actual loss. This high observed loss is due principally to two causes: First—In practice only the net heating value of the light oil vapour is utilized; the moisture which is formed escaping in the form of a vapour in practically every instance where gas is used. Secondly—The opinion by observation is likely to be formed as soon as the light oil recovery plant is put in operation, and before the re-adjustment of the air supply to the burners is made.

In the accompanying table, an analysis of bye-product coke-oven fuel gas is given, showing the amount of air required for combustion, the amount of heat liberated, and other data. It will be noticed that benzene occupies only 1·1 per cent. by volume of the original gas, but that it furnishes 7·4 per cent. of the total heat which is liberated when the gas is burned; also that this 1·1 per cent. of benzene requires 8 per cent. of the total air which is required for combustion. It follows from this that, if the light oil be removed from the gas by scrubbing, then until the air supply to the burners has been re-adjusted, the heating will be affected in two ways: (*a*) The loss of nearly 7·4 per cent. in calorific value, and (*b*) burning with an excess of nearly 8 per cent. of air. This lowers the flame temperature, and gives the appearance of a gas of much lower heating value.

One interesting fact, which may be confirmed by a few simple calculations, is that the percentage decrease in flame temperature due to removing the light oil is less than the percentage decrease in its calorific power, provided the air supply to the burners is properly adjusted. This is true, because the flame temperature of light oil vapour is somewhat less than the proportional average of the other constituents in the gas.

The table shows the analysis of coke-oven gas before and after scrubbing. Some coke-oven plants are producing an unseparated gas much richer than the one shown, while others produce a gas of considerably poorer quality. The analysis does not represent an average of any number of plants. It is selected only as an example. The table is based on the volumetric relation which exists between the gas, the air required for its combustion, and the products formed during combustion. The figures refer to 1 cubic foot of the gas under standard conditions.

Conclusions.

The actual loss in the gross calorific value of the gas due to the removal of light oil is about 5·8 per cent. at plants when the removal takes place with a fair degree of completeness.

The theoretical loss is practically the same as the actual loss. This is an average determination.

Some plants show greater actual loss than the theoretical loss, and some *vice versâ*. All agree within the limits of probable error in determination.

The observed loss due to the removal of the light oil is considerably greater than the actual loss. This is accounted for by the difference between the gross and the net heating values, and an improper adjustment of the air supply to the burners.

The observed loss has led many gas engineers to believe that the actual loss is greater than it really is.

The true value of light oil in a gas lies in its effectiveness per unit volume. One and one-tenth per cent. of light oil by volume furnishes 7·4 per cent. of the total heat which is formed when the gas is burned.

Table *Showing Gas Analysis, Amount of Air Required for Combustion, Amount of Heat Generated, &c.*

Analysis per Cent. by Volume Before Scrubbing.		Required for Combustion.				Products of Combustion.			Amount of Heat.	
		O_2.	N_2.	Air.	Per Cent. of Total Air.	CO_2.	H_2O.	N_2.	B.Th.U.	Per Cent. of Total.
CO_2	1·7	0·000	0·000	0·000	000·0	0·017	0·000	0·000	0	0·0
C_6H_6	1·1	0·082	0·312	0·394	008·0	0·066	0·033	0·312	41	7·4
C_2H_4	2·0	0·060	0·227	0·287	005·9	0·040	0·040	0·227	31	5·6
O_2	0·5	−0·005	−0·019	−0·024	−000·5	0·000	0·000	−0·019	0	0·0
CO	5·8	0·029	0·109	0·138	002·8	0·058	0·000	0·109	18	3·3
CH_4	30·0	0·600	2·268	2·868	058·5	0·300	0·600	2·268	297	53·7
H_2	52·0	0·260	0·983	1·243	025·3	0·000	0·520	0·983	166	30·0
N_2	6·9	0·000	0·000	0·000	000·0	0·000	0·000	0·069	0	0·0
Total	100·0	1·026	3·880	4·906	100·0	0·481	1·193	3·949	553	100·0
After Scrubbing.										
CO_2	1·7	0·000	0·000	0·000	000·0	0·017	0·000	0·000	0	0·0
C_6H_6	0·1	0·007	0·028	0·035	000·8	0·006	0·003	0·028	4	0·8
C_2H_4	2·0	0·060	0·227	0·287	006·2	0·040	0·040	0·227	31	5·9
O_2	0·5	−0·005	−0·019	−0·024	000·5	0·000	0·000	0·019	0	0·0
CO	5·9	0·029	0·111	0·141	003·1	0·059	0·000	0·111	19	3·6
CH_4	30·3	0·606	2·291	2·897	063·1	0·303	0·606	2·291	300	57·5
H_2	52·5	0·263	0·992	1·255	027·3	0·000	0·525	0·992	168	32·2
N_2	7·0	0·000	0·000	0·000	000·0	0·000	0·000	0·070	0	0·0
Total	100·0	0·960	3·630	4·591	100·0	0·425	1·174	3·707	522	100·0

OXIDE OF IRON PURIFICATION IN CALIFORNIA.

After perusing the valuable paper on this subject submitted by Mr. W. C. Jones, of Brierley Hill, at the recent meeting of the Midland Association of Gas Engineers and Managers, together with the no less valuable discussion that was elicited by it [see "Journal" for Oct. 31, p. 237], one may turn with interest to read of experiences in the use of oxide in a different climate and in other varying circumstances, as set forth in a paper by another Mr. Jones (who is the Engineer of the Gas Department of the Pacific Gas and Electric Company, San Francisco, California), delivered a few weeks ago at the annual convention of the Pacific Coast Gas Association.

The use of lime for the purification of gas has been generally abandoned in California, in favour of oxide of iron; and, on account of the heavy cost of carriage, it was usually more economical to prepare the material on the works than to buy it from outside. The details of the preparation had not received much attention on the East Coast, because there was such a small amount of sulphur in the Californian oils (which formed the staple gas producing material in the district) that almost anything in the way of oxide would show good working results and have a long active life. The sulphur content of coal might be anything up to 4 per cent.; but the average sulphur content of oil from the San Joaquin valley was less than 1 per cent.

Ferrous sulphate—also known as copperas, or as green vitriol—could be prepared by dissolving scrap iron in sulphuric acid The composition was indicated by the formula $FeSO_4 + 7H_2O$. The value was $12 to $16 per ton; and it was reduced by admixture with local burnt lime, costing $12 per ton, using pine-wood shavings as a vehicle—making an ideal purifying mixture. Pine shavings or sawdust were generally used as being plentiful and free from acid, or readily neutralized by a slight excess of lime. The shavings weighed 4·2 lbs. per cubic foot, and the sawdust 10·2 lbs. Other lightening materials used were ground cork or corn cobs, which weighed 4·8 and 12 lbs. per cubic foot respectively. Shavings (not too coarse) were preferred to a dense material such as sawdust, which was liable to become clogged, and cause trouble on account of back-pressure, as the sulphur content increased. Shavings did not afford so much surface contact with the gas; but this disadvantage was more than offset by the saving in labour.

As the weight of sulphur was 127 lbs. per cubic foot, a completely fouled oxide containing 64 per cent. of this substance should show an increased bulk of more than 21 per cent. If shavings were used, however, there was no apparent increase in bulk as compared with the fresh material; and it was possible to run very much thicker layers, and to revivify *in situ*.

The final result of mixing copperas, cream of lime, and shavings was a precipitated hydrated ferric oxide. The lime and copperas formed ferrous oxide—a substance that rapidly oxidized to ferric oxide on exposure to air. A parcel of 556 lbs. of copperas required for complete decomposition 148 lbs. of calcium hydrate, and produced 160 lbs. of ferric oxide. Such a proportion of shavings was used that the mixture contained only a small percentage of ferric oxide; but it was usual to increase the proportion of this substance by the addition of iron rust.

The original method of mixing by hand consisted of spreading the shavings in layers of 6 inches in thickness, throwing on the cream of lime by means of buckets, and turning with the shovel until thoroughly coated. The copperas was melted in a barrel by means of a steam jet, and the solution was added to the limed

shavings spread in thin layers. Oxidation would at once commence, as shown by the change of colour from a dull, dark green to a reddish brown; and the mixture was repeatedly turned until the colour was uniform throughout and the material soft to the touch. After trying various formulæ, the author had fixed on the following proportions: Copperas, 225 lbs.; quicklime, 56 lbs.; pine shavings, 60 lbs.; iron rust, 10 lbs. The cost of making up a supply comprising 2100 cubic feet of this mixture, in 1913, was 41 c. per cubic foot. In 1915, a larger quantity (7378 cubic feet) was prepared with the aid of a concrete mixer and other facilities for handling, slaking lime, &c., which brought down the cost per cubic foot to 19½ c.

The iron rust was prepared by spreading clean borings or turnings—cast iron for preference—in a thin layer, and moistening with a solution of sal ammoniac. The material was well turned and broken-up daily until it appeared to be fairly well oxidized, when it was screened through a fine screen of at least 16 meshes to the inch. Any portion that would not pass the screen was again rusted, and so on until the whole would pass through. By this procedure, complete oxidation and absence of free iron was assured. This was important, on account of the reaction of carbon monoxide with free iron to form ferric carbonyl, $Fe(CO)_5$, which decomposed at the burners, forming troublesome deposits hat choked the openings and ruined the mantles.

The first essential in the dry purification of gas was to maintain the material in a clean state, free from tar or oil. If this was assured, and a suitably prepared oxide used, the new material might be put into a purifying box, and not disturbed in any way until it contained 65 per cent. of sulphur and was completely spent. This, of course, included revivification *in situ*, either by admission of air with the gas or by cutting out the box occasionally and drawing a stream of air through it. The first method was quite satisfactory when the excess of nitrogen carried forward in the purified gas was not an objection. The condition governing the satisfactory use of 2 to 3 per cent. of air admitted with the gas was that the sulphiding should be completed before the gas reached the last box, because the reactions with sulphuretted hydrogen and with oxygen would not occur at one and the same time. Mr. Byron E. Chollar had, it appears, based his reversal method on this fact.

For effective revivification in a cut-out box, the air should be drawn downward, never upward, preferably by a suction fan type exhauster, through large connections situated in the centre of the box. The upper surface of the material could be under observation, and the fan stopped if excessive heating was evident, and when the action was completed water should be added to the material. Care should be taken to maintain an alkaline condition, and a sample should be frequently tested by stirring with distilled water, which should be decidedly blue to litmus. If an acid reaction was obtained, a small quantity of ammoniacal liquor or milk of lime should be used for the next damping-down. The first box in the series would take up about 90 per cent. of the sulphuretted hydrogen present in the gas; and as soon as its powers showed signs of weakening, it should either be shut off for revivifying, or the order of rotation should be changed. At this stage, the revivification could be effected rapidly, and with a minimum risk of overheating; but if allowed to go on until completely saturated, the revivification would be slow, and there would be danger of overheating.

The usual plan was to calculate the area of the purifying vessels on the basis of the volume of gas to be treated; a general rule being: Volume of oxide between main inlet and outlet of purifiers equals one-twentieth of the make per hour. This did not take any account of the work to be done, as represented by the actual quantity of sulphuretted hydrogen to be removed, which might be anything between 150 and 450 grains per 100 cubic feet of gas. So he preferred the rule:

$$\frac{\text{Maximum hourly flow of gas} \times H_2S \text{ content in grains per 100 cub. ft.}}{4000}$$

Nearly all the established rules were based on the superficial area of the boxes, without reference to depth or thickness of the layers of material, which in his experience was limited only by back-pressure. He was successfully working tower purifiers of comparatively small area, but containing layers up to 15 feet in thickness. The efficiency of the oxide depended largely on its physical condition; purifying capacity was not dependent on surface area alone, but rather on the cubic content of material used. Illustrations were exhibited of tower purifiers that could be erected at a great saving of outlay and ground space, thus securing maximum purifying capacity at a minimum cost.

A convenient method of testing the purification efficiency of a new batch of oxide was to take a sample of about 12 oz., place it in a glass purifier (the condenser that formed a part of the London Referees sulphur test, with the marbles removed, answered well for the purpose), and pass either pure sulphuretted hydrogen or foul gas through until the material was quite saturated, when it was removed and thoroughly revivified by exposure to the air. This was repeated at least four times, or until saturation was reached; and a 250-grain sample for testing was taken after the completion of each revivification. A sample thus treated six times showed 18, 32, 43, 52, 59, and 66 per cent. of sulphur after each exposure respectively.

According to the formula, $Fe_2O_3 + 3H_2S = Fe_2S_3 + 3H_2O$, 159 lbs. of Fe_2O_3 required 102 lbs. of H_2S to complete the reaction; so 1 lb. of pure Fe_2O_3 would absorb 0·64 lb. of H_2S, and 1 cubic foot of prepared material, weighing 41 lbs., on a basis of 10 per cent. of Fe_2O_3, would take up 2·62 lbs. of H_2S. The weight per cubic foot and the percentage of Fe_2O_3 being known, the absorbing power of a sample was a matter of simple proportion.

TRANSPORT OF HOT FLUID PITCH FOR BRIQUETTE MAKING.

The "Journal of the Society of Chemical Industry" translates from the "Zeitschrift fur Angewante Chemie" [1916, No. 29, p. 549] an article dealing with the transport of hot fluid coal-tar pitch in tank-waggons for briquette manufacture. The briquette factory in question is at a Silesian colliery that obtains a supply of pitch direct from a neighbouring coal-tar distillery in a fluid form transported in tank-waggons. The system has already been in operation at Bochum, where the waggons, holding 15 tons each, are charged with pitch from the retorts at 250° C. In this case the distance on rail is 4 km., and the time between filling and emptying seven hours. The fluid pitch is readily discharged by compressed air. This system is intended to work in conjunction with the Fohr-Kleinschmidt method of briquetting. The pitch is heated to 130° to 170° C. to bring it to a mobile condition, and then sprayed by a steam-heated atomizer, worked with steam or compressed air, into a mixing drum, where the pitch spray solidifies while still in the air to a very fine soot-like dust. Under the slow rotation of the drum and the action of suitable elevating and transporting arrangements, an intimate mixture of the coal dust and binder is produced, which is then passed to a kneading apparatus with superheated steam, and finally pressed into briquettes at 50° to 80° C. By this process the proportion of pitch in the briquettes is reduced by fully 1 per cent. (on an average percentage of 7), and the costs of manufacture are further decreased by the tank-waggon system of transport. The tank-waggons can be emptied in fifteen minutes; and the necessity of handling, breaking, and melting the pitch is avoided.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Metal Working Gas-Furnaces.

SIR,—May I point out something which appears to be an error in your issue of Nov. 14? On p. 341, in a paragraph headed "Metal Working Gas-Furnaces," translated from the "Journal des Usines à Gas," in the last three lines it is said: "It is found that about 11,000 cubic feet of gas suffice for the heating of some 50 tons of steel bars." Surely this is metres, is it not? Or some other measure? Because 220 cubic feet per ton for heating steel bars to a forging temperature appears a tall order even to me. This would be 1-10th cubic foot per pound, which is considerably below theoretical possibilities.

A. C. IONIDES, JUN.

34, *Porchester Terrace, W., Nov.* 15, 1916.

[The quantities are correctly translated and converted from the Frenc original, where it is stated that 320 cubic metres of gas suffice for the treatment of 50,000 kilos of bars. Taking 1000 kilos as a little less than the English ton, it will be seen that the quantity of gas for 50 tons is 320 cubic metres, or just over 11,000 cubic feet. Possibly our correspondent overlooks the fact that in the furnace described it is the ends only of the bars which are brought to a forging temperature.—ED. J. G. L.]

Discussion on Mr. Purves' Address—An Omission.

SIR,—I would feel obliged if you would rectify an omission in the report of my remarks on the inaugural address by Mr. Purves [see *ante*, p. 298], as it entirely alters the point made.

Referring to the portion of the address in which the author quotes Mr. Curphy, I said that regarding the irregular working of the purifiers, as to which Mr. Curphy put the question: "Might not this be due to the ammonia content in the gas being at one period at a maximum and at another one absent altogether?" [not having the paper I quote from memory], I was of opinion that the excess ammonia would be taken up and retained by the moisture in the oxide, and so would be at hand to counteract the effect of the period of ammonia absence in the gas—inferring, of course, that the irregular working must be due to some other cause than that of the intermittent ammonia content in the gas.

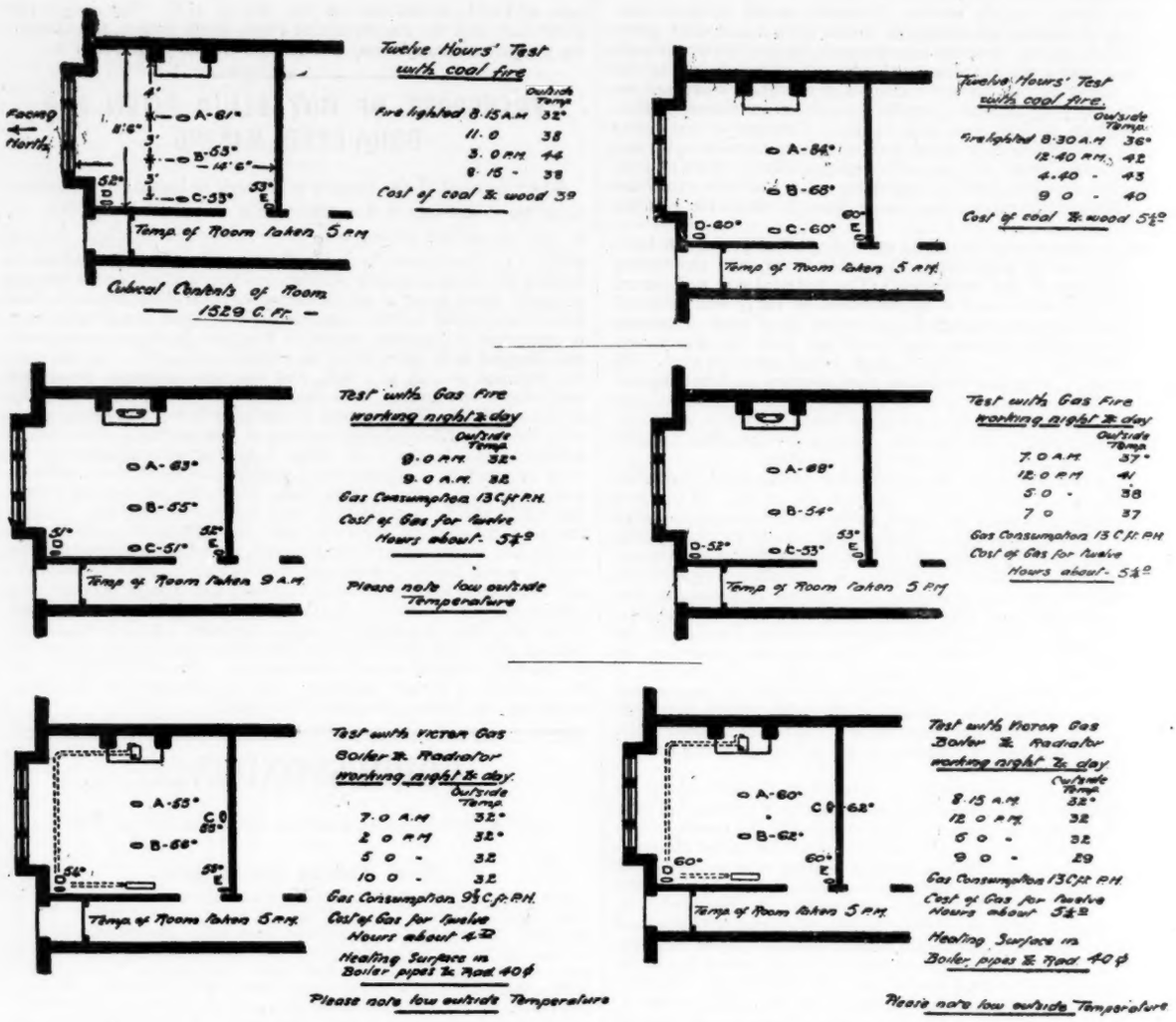
JOHN WILSON.

Greenock, Nov. 11, 1916.

Heating and Ventilating Dwellings.

SIR,—With regard to the paper Mr. Hanssen read before the Society of Engineers, as reported in the last issue of the "JOURNAL," I enclose some comparative tests of warming rooms by a coal-fire, by a gas-fire, and by a gas-heated low-pressure hot water system. Owing to the shortness of staff, I am quite unable to enter into a long discussion; but the diagrams explain themselves. The tests were all made in one room. The coal-fire was a good register grate; the gas-fire a modern one placed in front of the grate; and the water system a "Victor" boiler connected with a radiator placed at the opposite side of the room. The thermometers A, B, and C were placed on chairs in different parts of the room; and the thermometers E and D were on the walls, 4 ft. 6 in. above the floor.

The results show that Mr. Hanssen is hopelessly wrong in his esti-


Twelve Hours' Test with coal fire
Fire lighted 8.15 A.M 32°
11.0 38
3.0 P.M 44
8.15 - 38
Cost of coal & wood 3d
Temp of Room taken 5 P.M
Cubical Contents of Room — 1529 C. Ft. —
Twelve Hours' Test with coal fire.
Fire lighted 8.30 A.M 36°
12.40 P.M. 42
4.40 - 43
9 0 - 40
Cost of coal & wood 5½d
Test with Gas Fire working night & day
9.0 P.M. 32°
9.0 A.M. 32
Gas Consumption 13 C.ft P.H.
Cost of Gas for twelve Hours about 5½d
Please note low outside Temperature
Test with Gas Fire working night & day
7.0 A.M. 37°
12.0 P.M 41
5.0 - 38
7 0 37
Gas Consumption 13 C.ft P.H
Cost of Gas for twelve Hours about 5½d
Test with VICTOR Gas Boiler & Radiator working night & day
7.0 A.M 32°
2 0 P.M 32°
5 0 - 32
10 0 - 32
Gas Consumption 9½ C.ft P.H.
Cost of Gas for twelve Hours about 4d
Heating Surface in Boiler pipes & Rad 40 ft
Please note low outside Temperature
Test with Meter Gas Boiler & Radiator working night & day
8.15 A.M 32°
12 0 P.M 32
5 0 - 32
9 0 - 29
Gas Consumption 13 C.ft P.H
Cost of Gas for twelve Hours about 5½d
Heating Surface in Boiler pipes & Rad 40 ft
Please note low outside Temperature

TESTS WITH COAL, GAS-FIRE, AND GAS-HEATED HOT-WATER APPARATUS.

mate of comparative costs as between coal and gas, and bear out what Mr. Creasey said in the discussion.

For equal results I estimate the costs to be as follows:

Coal fire . . . . . 3d. for twelve hours.
Gas ,, ... 5d. ,, ,,

Coal cost 38s. 4d. per ton; gas 2s. 10d. (war prices).

But using a gas-heated hot-water system with boiler, pipes, and radiators in rooms, the cost is, as seen by the diagrams, the same as for a coal-fire.

THOS. POTTERTON.

Cavendish Works, Balham, S.W., Nov. 13, 1916.

REGISTER OF PATENTS.

Removing Coke Discharged from Retorts or Furnaces.

DRAKES LIMITED, and DRAKE, J. W., of Ovenden, Halifax.

No. 14,565; Oct. 15, 1915.

This invention relates to apparatus for the removal of coke discharged from retorts, coke-ovens, or furnaces—especially for the removal of coke when discharged from tiers of horizontal or inclined gas retorts.

The patentees remark: In the removal of coke from retorts, &c., by the devices heretofore employed, whether of the character of conveyors, telphers, or other apparatus, the red-hot coke has had to be carried in front of the whole series of benches of retorts intervening between the retort and the exit at one end of the retort-house—thus the conveying of coke at this high temperature has greatly interfered with work being carried out, either by way of repairs or otherwise, in connection with the retorts across the fronts of which the discharged coke was being transported. Further than this, considerable depreciation, by abrasion and otherwise, occurs when this system of dealing with the red-hot coke is made use of.

To obviate these undesirable features, the inventors propose means that will quickly convey or deposit the red-hot coke from the position where it is discharged from the retort or furnace, immediately into such a place or position where it may be afterwards cooled, slaked, or otherwise treated as desired without interfering in any way with the freedom of access to the adjoining retorts. They propose to arrange apparatus which can be moved along the front outer ends of the series of retorts so as to receive the discharged red-hot coke and immediately convey it in the same direction as it is discharged to the outside of the retort house on to receptacles or prepared surfaces of such a character as will permit the slaking as and when desired.

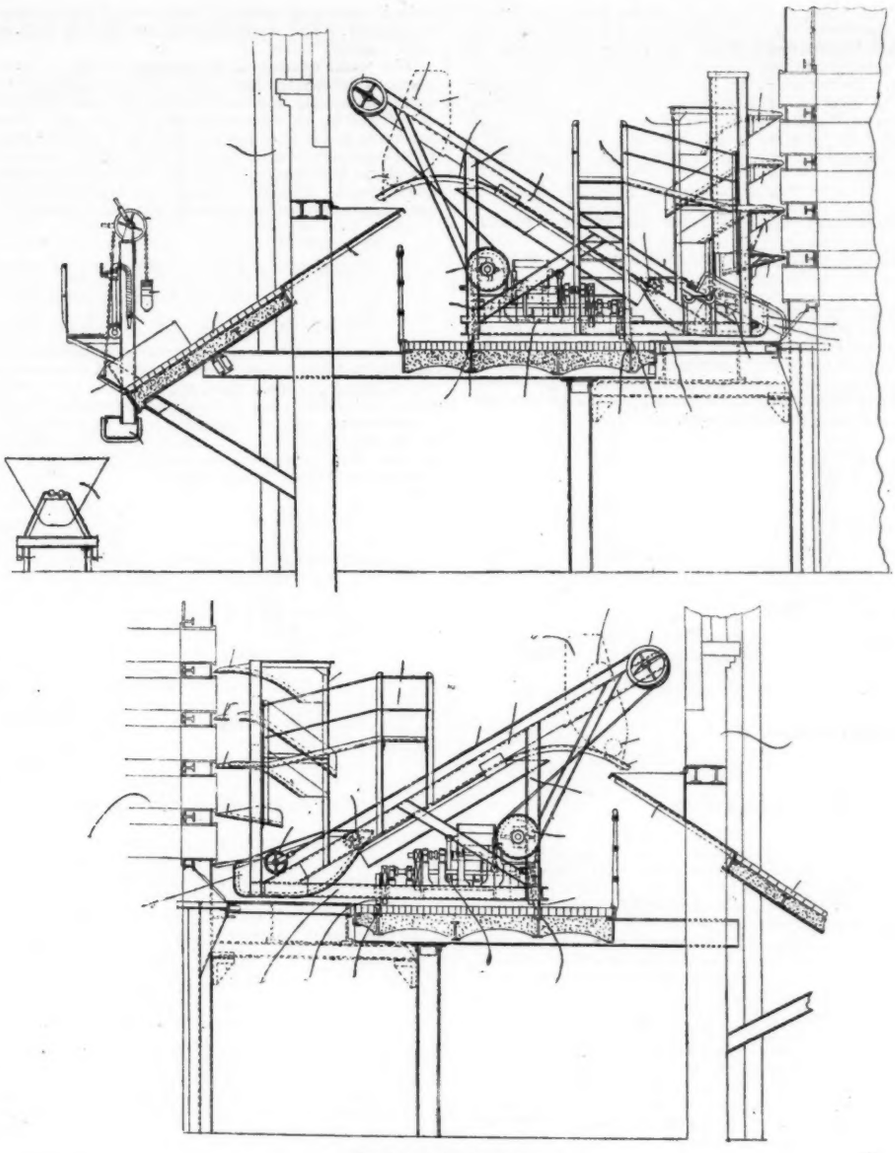
A vehicle of appropriate construction (hereafter referred to as the main vehicle) is arranged, as shown, to carry devices for receiving the coke as discharged from any one of the retorts. The devices (which may consist of an additional vehicle or a hinged shoot) are arranged to be movable upon the main vehicle, so that they are enabled to discharge their contents on to appropriate shoots or inclined surfaces arranged along the wall of the retort-house opposite the ends of the series of retorts, by which arrangement, immediately the discharged coke from a retort has been received by the receptacle, the latter may be moved to deposit it on to the inclined surfaces or shoots adjoining, so that these latter may take it to surfaces of refractory or other suitable material, where it may remain until the attendant wishes to remove it after it has cooled, either by being slaked or otherwise.

Adjoining the prepared surface upon which the coke is thus deposited is a trough or gutter to receive the water used for cooling the coke, as also for receiving any breeze carried by the water. The coke thus treated is kept clean, and the matter separated from it can be readily removed when, or at such times as may be, found advantageous.

The main vehicle which is to travel along the front of the structure into which the retorts are built is formed of framework, so that the wheels supporting it may run on rails; while the framework may support other devices or means whereby the whole may be propelled (either manually or mechanically) over the rails to any desired position.

In accordance with one arrangement, the receptacle employed for receiving the coke consists of a waggon constructed to travel over rails carried by the framework of the main vehicle. These rails for the wheels of the additional vehicle are so inclined and arranged that, on the vehicle being drawn up or caused to travel over them (as by winch, rope, rack and pinion, or other mechanical means), on reaching the desired height the front set of wheels will commence to descend while the rear wheels continue to rise until the vehicle is brought into such a position that it will discharge its contents on to the inclined plates already referred to, from which it will slide down the inclined surfaces prepared to receive it.

In making use of the vehicle travelling over rails which thus raises the discharged coke to the desired level, the patentees also make use of a series of inclined shoots mounted upon the framework of the main vehicle, so that the coke discharged from the upper retorts will be



Drake's Coke Discharger.

received by the upper shoots and pass over those adjoining the discharge orifices of the lower retorts. Thus the shoots for the upper retorts are longer than those for the retorts beneath. In order that the additional vehicle may receive the coke deposited from any of the shoots, it is arranged so that when receiving a charge from the lowest retort the vehicle is upon the lower ends of the rails over which it has to travel; while when receiving the coke discharged from the higher retorts, the vehicle is moved upwards over its rails into position to receive the discharged coke without having to descend or fall to any extent that would cause its breaking up.

A sectional end elevation of a building showing series of horizontal retorts, and the apparatus arranged in connection therewith, is given; also a similar view but illustrating the several parts as seen in the opposite direction.

Automatically Controlling Gas-Lamps.

Law, J. R. K., of Glasgow.

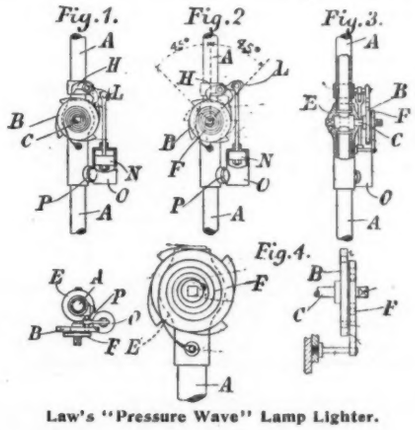
No. 14,635; Oct. 16, 1915.

This spring-operated device, of the escapement type, works on the "wave" system. The device is not only cheap, but can be readily fitted to existing lamps.

Fig. 1 is a front elevation and plan of the device, showing the escapement in one position. Fig. 2 shows it in the other position. Fig. 3 is a part section and part side elevation corresponding to fig. 1. Fig. 4 is an enlarged view of part of the mechanism.

The device consists of a wheel or disc B rigidly secured to the spindle C of the plug of the gas supply cock E on the gas supply pipe A. In connection with the spindle is a small drum or enlargement to which is secured one end of a volute spring F, the other end of which is secured to a pin projecting from the side of the valve. The spring is retained in the wound position by an escapement lever H working on a pin projecting from a collar on the gas-pipe. The lever is adapted to engage one of four teeth arranged at diametrically opposite points on the periphery of the disc B and at an angle of 90° to one another. The escapement is moved by means of an arm L connected, by a pin and slot, to the rod of a weighted piston N working within a cylinder O, which communicates, by a branch P, with the gas supply pipe.

The *modus operandi* is as follows: The lamp attendant winds up the spring connected with each cock and the escapement automatically engages one of the teeth on the disc B so as to retain the spring in its wound condition. When a wave of additional gas pressure acts on the



Law's "Pressure Wave" Lamp Lighter.

piston N, it forces it to the top of the cylinder O, thereby rocking the escapement lever and disengaging a tooth so that it may move into the dotted position shown in fig. 2, whereupon it is again held—the extent of movement permitted being 45°. In moving through this angle, the plug of the tap is partially closed. When the pressure wave subsides,

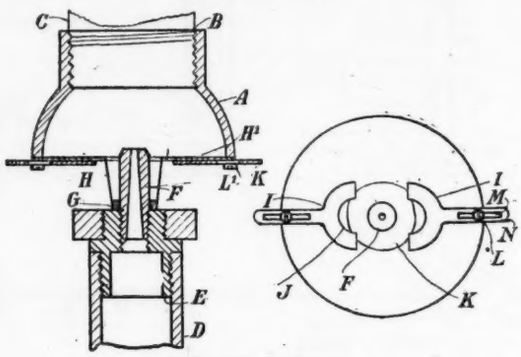
the piston moves back again in the cylinder under gravity action and again rocks the escapement H so as to release another tooth and allow it to move through a further angle of 45° and return the plug to the completely closed position—whereupon the second tooth will be held by the escapement. In this way, the rise and fall of the wave gives two movements each through an angle of 45° ; so the plug is turned through an angle of 90° and is opened or shut as the case may be. When the parts are in the position as shown in fig. 3, the gas supply is turned on, and therefore the plug has to be turned through an angle of 90° to turn the gas off.

Heating Burners for Gas of Low Calorific Value.

HALL, I., of Aston, Birmingham.

No. 14,624; Oct. 16, 1915.

This invention relates to burners of the atmospheric kind depending for their supply of air upon induction through an inlet open to the atmosphere as differentiated from those which use a supply of compressed air. It relates more particularly to burners in which the air inlet body has a boss to which is connected a pipe forming a mixing-chamber, another boss for connecting the gas supply, bridge bars connecting the bosses, and an adjustable gas-jet.



Hall's Heating Burner.

A sectional elevation and plan of one form of the burner are given.

The air inlet body A is of dome or funnel-shape, with a boss B into which a pipe C is screwed. The pipe forms a mixing-chamber, and is connected with the nozzle at which the combustible mixture issues. The combustible gas is introduced by way of the pipe D, which is screwed into or on to a second boss E in alignment with, but opposite to, the boss B. The boss E is tapped to accommodate the jet member F, which is adjustable axially and can be locked in any position by a nut G. Bridge bars H connect the air inlet with the boss E, and a detachable plate with a variable middle aperture is fixed to the underface of the air inlet body, to vary the volume of induced air.

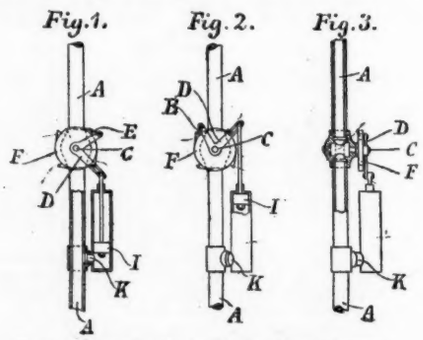
The adjusting means comprises two segments I, each with a semi-circular recess J at the part in proximity to the jet—the segments being adjustable transversely to the axis of the air inlet in order to regulate the amount of air inducted. The air passes through the annular space K immediately surrounding the jet. The segments I may be locked in position by set-screws L, which pass through slots M in the outer thumb-pieces N of the segments.

Automatically Controlling Gas-Lamps.

LAW, J. R. K., of Glasgow.

No. 14,636; Oct. 16, 1915.

This is another [see p. 401] automatically acting device for turning the supply of gas to gas-lamps on and off as desired.



Law's Automatic Controller for Street-Lamps.

Fig. 1 is a front view of the device with the gas-cock open. Fig. 2 shows the cock closed. Fig. 3 is a side view (corresponding to fig. 1) with part in section.

The device consists of a bell-crank lever D capable of working freely on the spindle C. On one arm there is a pawl E, adapted to engage with ratchet teeth on a wheel or disc F keyed on the spindle. The disc has four teeth arranged at intervals round the periphery and at an angle of 90° to one another. The bell crank is connected by a pin and slot arrangement to the rod of the piston I, which works within a cylinder communicating, at its lower end, by the connection K with the gas-pipe A. The piston is weighted so as to fall, under gravity, after each pressure wave.

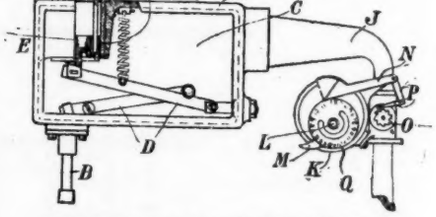
The *modus operandi* is as follows; When a wave takes place, the piston is forced upwards and causes the pawl E to engage the first tooth on the disc and turn the wheel F and spindle C through an arc of 90° (see fig. 2), thereby turning off the gas. When the wave subsides, the piston falls again to the fig. 1 position, and the pawl thereupon engages the next tooth, so that when a second wave takes place the piston will again rise and the wheel F be pushed through another angle of 90°. This turns the gas on again (as fig. 3), and so on—the gas being turned off or on at each succeeding wave.

Regulating and Controlling Temperature.

HALL, I., of Aston, Birmingham.

No. 14,996; Oct. 23, 1915. No. 4910; April 4, 1916.

This combined invention relates to apparatus for regulating, controlling, and maintaining a predetermined temperature for a predetermined period or time. Such appliances as have previously been proposed have relied upon electrical means or the distortion of a member —for instance, part of a manometer for regulating the supply of heating or combustible fluid in accordance with the desired temperature ; whereas the present invention employs for the purpose members having different co-efficients of expansion.



Hall's Regulating Apparatus for Gas-Stoves.

The heat regulator A comprises a thermostat in the form of a heat tube of metal B containing a carbon (or other non-metallic) stick ; a gas-tight chamber C ; two or more amplifying levers D for transmitting and increasing the movement originating from the thermostat ; a valve E pivotally mounted on the end of one of the levers D and arranged in the chamber C ; a valve-seat F, against which the valve acts to vary the supply of gas, and means (comprising an external knob G) for adjusting the valve seat, which is externally screwed, from the exterior, so that the temperature at which the valve cuts-off can be varied as required. The heat tube B, comprising members with different co-efficients of expansion, is inserted in the stove to occupy a position preferably in the back upper corner. The outlet J of the box C may be controlled through the medium of a clock device K, having a rotatable spindle L, on the outer exterior end of which is mounted a trip-projection M, adopted to operate a gravity lever N. This lever is adapted to turn a ratchet wheel O on the end of the rotary gas controlling valve, and thereby shut-off, or turn on, the gas supply, through the agency of two pivoted transmitting levers P. The operation of the clock device K is to shut-off the gas completely at any predetermined moment, or, if desired, to turn the gas on by a second and further movement of the gas-valve. The time setting can be varied as required, and is visibly indicated on the dial Q.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for Nov. 15.]

Nos. 15,814—16,206.

BEARD, G. F. H.—"Extracting tars, tar vapours, &c., from gases." No. 16,058.

BRIDGES, A. W.—"Apparatus to give audible warning on decrease of pressure of gas supply." No. 15,830.

BURDICK, C. L.—"Purifier for air or gas." No. 15,952.

CARDWELL, D.—"Purification of trinitrotoluene. No. 15,816.

CLAYTON ANILINE COMPANY.—See Cardwell. No. 15,816.

DEMPSTER, R. & J.—See Beard. No. 16,058.

GREENWOOD, T.—"Light controlling appliances for lamps." No. 16,007.

HALL, N.—See Bridges. No. 15,830.

HEYL, G. E.—"Process for obtaining substitute for creosote oil, and product thereof." No. 16,169.

KEITH, G. & J.—"Manufacture of mantles." No. 16,135.

NEWELL, O.—"Gas stoves, ranges, &c." No. 15,831.

O'BYRNE, P.—See Newell. No. 15,831.

PALMER, W. A.—"Coin-freed meters." No. 15,926.

PIGGOTT, T., AND CO.—"Circular tanks. No. 16,194.

ROBIN, J. T.—"Manufacture of mantles." See Keith. No. 16,135.

SCOTT, J. W.—See Beard. No. 16,058.

Gas-Fitters before the Tribunal.—The Manager to the Brierley Hill Gas Company (Mr. W. C. Jones) applied to the Tribunal last Friday for two men—one a gas-fitter and the other a mechanic and gas-fitter, both being married. He explained that the Company had now only three gas-fitters left out of ten ; and the Tribunal granted three months' exemption in each case.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF COMMONS.

Coal Supplies.

Sir JOSEPH WALTON asked the President of the Board of Trade whether he is aware that many collieries have recently worked short time; and whether, in view of the need for an increased output of coal, he will arrange to issue shipment licences more freely, and to stock coals at munition works and gas-works, to enable pits to work full time in future.

Mr. RUNCIMAN: The loss of output referred to has been due, not to the restriction of export licences, but to difficulties in connection with the supply of tonnage. Steps have been taken by the Board of Trade and the Ministry of Munitions, both directly and through certain of the District Coal and Coke Supplies Committees, to call the attention of consumers to the importance of taking advantage of the opportunity to increase their stocks.

Trinitrotoluol Poisoning.

In reply to questions, it was stated last Tuesday that the number of deaths from "T.N.T." poisoning for the six months ended Oct. 31 was 41. It was impossible to say how many of these were caused by inhalation of fumes; there was no reason to think that absorption through the skin was the chief danger; and there might be absorption of poison by both channels in the same case. A strong Committee was appointed a short time since by the Ministry of Munitions, after consultation with the Secretary of State for the Home Department, to examine the problems arising out of "T.N.T." poisoning, both from the mechanical and medical points of view, and to make recommendations to the Ministry. Much useful work has already been done by the Committee; and the recommendations so far made have been adopted by the Ministry, and are being put into effect.

"Veritas" Gas-Mantles.

Major HUNT asked the President of the Board of Trade whether he is aware that the British Incandescent Mantle Works, Limited, have been working at full speed in turning out "Veritas" mantles, the whole of which output is taken by Messrs. Falk, Stadelmann, and Co., Limited; whether he is aware that the demand for these mantles is so great that Messrs. Falk, Stadelmann, and Co. are having additional supplies made by Joseph T. Robin, Limited, the Managing-Director of which is Joseph T. Robin, the Government Adviser on incandescent mantles, to meet the demand; and whether it is with the sanction of the Board of Trade that such mantles are marked "Veritas," the trade mark of the British Incandescent Works, an enemy firm now being wound up.

Mr. PRETYMAN: The trade mark referred to is registered in the name of Messrs. Falk, Stadelmann, and Co., and not in that of the British Incandescent Mantle Works; and the former Company are therefore entitled to use it upon the mantles they sell, and have them manufactured with the mark by any firm they please.

Enemy Shareholdings.

Sir RICHARD COOPER asked the President of the Board of Trade if he would state how many shares are held by enemy aliens in Messrs. Falk, Stadelmann, and Co.; what proportion they bear to the total number issued; and when these shares will be sold, and whether by public tender or private treaty.

Mr. PRETYMAN: 78,477 shares, representing one-fifth of the issued capital of Messrs. Falk, Stadelmann, and Co., are held by enemy subjects. The date and method of their sale are under consideration.

LEGAL INTELLIGENCE.

ENEMY MANTLES STOPPED BY THE CUSTOMS.

In the City of London Court, last Monday week, Mr. Robert C. Radeglia, trading as the Southwark Lighting Company, of No. 3, Love Lane, E.C., brought an action against the Standard Incandescent Works Company, Billiter House, E.C., to recover £72 6s. 3d. for 50 gross of "Universal" inverted mantles supplied at 29s. 6d. per gross, and 8000 labels at 2s. 6d. per 1000. Defendants counterclaimed for £52 10s. damages for the plaintiff's breach of contract for the sale of 100 gross of upright 18 one-ply "C" mantles at 23s. 6d. per gross, less 1s. per gross for labels, and 50 gross of 32 two-ply "Universal" inverted mantles at 29s. 6d. per gross. The upright mantles they alleged had not been delivered.

Mr. SIMMONDS said the plaintiff had recently given up his business and joined the Army. He had taken over the business of one Brinkman, who was a German, and who was interned, and he had carried out with the defendants the contract which was originally entered into by Brinkman. The mantles were of genuine Dutch manufacture. Plaintiff had supplied 50 gross of the mantles ordered.

Mr. MORLE (for the defendants) said plaintiff had not delivered all the mantles ordered, because the Customs Authorities had held them up, and would not part with them.

Mr. SIMMONDS added that Brinkman's business was wound-up by the Board of Trade, and plaintiff had gone on with it. It was now stated that the mantles contained 25 per cent. ingredients of German manufacture, and therefore they were not of genuine Dutch origin. There was no doubt Lord Grey had placed an embargo on them. The mantles would remain with the Customs until the end of the war.

Mr. MORLE said the defendants had had to buy against the plaintiff, and now charged him with the difference in the counter-claim.

Plaintiff stated that at one time 72 cases coming from the Ozon factory in Holland were held up by the Customs, but afterwards released. The Customs would not allow any mantles to come into this country which contained 25 per cent. of German material. In witness's view, it was impossible for any chemist to say what country certain minerals came from.

Mr. *J. T. Robin*, of the Greyhound Lane Incandescent-Works, Streatham, said he acted as Board of Trade expert at the Customs, and had inspected the mantles in dispute. The Ozon Company declared them to have 22·3 per cent. enemy materials; but according to his own figure there was more than 35 per cent. That was in chemicals and yarn from which the gas-mantle was manufactured. He also found mantles of entirely German origin in some of the consignments. Of course, these were all stopped. If anything was wrong with any of the mantles, then the whole consignment was condemned, because the senders knew they had to be particular about their declarations, and they were not to attempt to mix up German goods with those which were manufactured in other countries. The goods now in dispute could certainly not be described as absolute Dutch manufacture. He examined in all 4½ million mantles coming from Holland. At the beginning of the war, some of the mantles coming from Holland as Dutch were simply repacked into other packages.

Mr. MORLE urged that defendants were entitled to such an amount as the Court thought was the difference between the contract price of 22s. 6d. and the market price in May last, which, according to the evidence, was 30s. and 33s.

Mr. *Percy Bullock*, defendants' manager, said he negotiated the contract with plaintiff. He sold the mantles to a customer; and as they could not get the goods, they were to be sued. The price in May was 33s. per gross. There was no difficulty in getting Dutch mantles.

Mr. *Thomas Harris*, Managing Director of Messrs. Albert Lea and Co., sellers of mantles, said it very rarely happened that two consignments of mantles came to this country alike. He sold some Dutch mantles for 33s., for which he paid 18s. 9d. per gross. They were bought twelve months before the sale. Mantles two months ago cost 30s. per gross, and "seconds" had been sold at 23s. 6d.

Mr. *E. A. Wood*, dealer in mantles, said he had bought quantities of 18 one-ply mantles. The price in May was 30s. to 33s. per gross.

Judge ATHERLEY-JONES, K.C., found for the plaintiff on the claim, which he said was practically not in dispute. On the counter-claim, the defendants were entitled to £17 beyond £19 paid into Court, as plaintiff was liable for the non-delivery of the mantles, however hard it might be.

Extensive Robberies at Manchester.

At the Manchester City Police Court recently, the Stipendiary Magistrate (Mr. E. Brierley) sentenced to three months' hard labour on each of three charges William Henry Graham, a well-known Manchester metal refiner and solder manufacturer, for being in possession of large quantities of ingots of lead, stamped "M.C.W.W." (Manchester Corporation Water-Works), and brass, stamped "Dempster" (the property of Messrs. R. & J. Dempster), together with a large amount of new lead-piping, brass gas-taps stamped "M C.G.W." (Manchester Corporation Gas-Works), brass unions and other articles (some of which belonged to West's Gas Improvement Company), and not being able to give a satisfactory account of ownership of same. Defendant said he bought about 10 to 15 tons of scrap metal every week from different brokers in Manchester; and it was impossible for him to say from whom he bought this particular lot. He pleaded that all the goods had been honestly come by in the course of his business. Evidence was given on behalf of the Water Department that robberies had been occurring from the Newton Heath stores during the last twelve months; scrap lead and ingots of lead being particularly missed. Under no circumstances did the Corporation sell lead to anyone. All scrap lead was used up at the works, and made into ingots. A representative of the Gas Department said a large number of robberies of piping and fittings had taken place during the last nine months; and he recognized property belonging to the department. Similar evidence was offered on behalf of Messrs. R. & J. Dempster; a foreman identifying several ingots of brass as having been stolen from the works during the last four years. On the application of the police, the Stipendiary ordered all the unidentified property to be confiscated, its value being placed at hundreds of pounds.

Ripon Gas Trouble being Overcome.—In accepting the Mayoralty of Ripon a second time, Mr. F. W. Hargrave (who is Chairman of the Gas Committee) said he thought the city had got over the worst part of the gas trouble. There had been necessary changes in the management, which he was hoping would be productive of good results; and, with care, he saw no reason why they should not be able to tide over the next year or two without any specially heavy outlay, though after a time the Council would find themselves compelled to consider the question very closely, with a view to making alterations in method and machinery for gas production.

Fatal Gas-Works Accident at Newcastle.—A verdict of "Accidental death" was returned by the Jury at an inquest on Robert Heard, a labourer employed by the Newcastle-on-Tyne Gas Company. Evidence was given by a fitter that there were in the Tyneside Road yard four travelling cranes, about 60 feet above the level of the yard, to convey skips of coke. Wire ropes were attached to a cross bar 8 ft. 9 in. long, and weighing 2 or 3 cwt. On going to the place after the accident, he found one of the skips lying on the ground, with both the wire rope attachments broken. He thought it was a case of overwinding. He had examined the brakes, and found them in perfect order. Another employee at the yard spoke to having seen the accident to the cross-bar, which had fallen on deceased, and had also injured another man. The craneman said he had full power on the engine at the time of the accident; but he knocked it off, and at the same time put on the brakes. The cross-bar caught the framework, and both the wire ropes broke.

MISCELLANEOUS NEWS.

THE GAS LIGHT AND COKE COMPANY.

Application to Parliament for Further Powers.

Statutory notice has been given by the Gas Light and Coke Company of their intention to apply to Parliament next session for a Bill to confer further powers upon them—mainly in reference to their internal affairs. The intended Act will seek to vary, repeal, or extinguish all existing rights, powers, and privileges which would in any manner interfere with or prevent the carrying into effect of any of the objects of the intended Act, and will confer other rights, powers, and privileges. The Bill will also incorporate with itself (with or without modification) or may render inapplicable the provisions of a long series of Public and Private Acts, Orders, and Schemes of Amalgamation. The main provisions to be sought by the new Act are summed up under the following heads.

Provision of Ships, Lighters, &c.—To confer further powers on the Company with reference to the provision, purchase, maintenance, and use of ships, lighters, and vessels in connection with or for the purposes of their undertaking; to authorize the Company to apply their funds to any of these purposes; to remove the limitation imposed by section 5 of the Company's Act of 1873, on the amount which the Company may apply for the purpose or other the purposes of that Act; to repeal section 6 of the Act of 1873; and to make such other amendments of the Act as may be necessary for the purposes named or any of them.

Annual Meetings, Interim Dividends, &c.—To provide for the holding of the ordinary meetings of the Company annually instead of half-yearly, and to authorize the declaration and payment by the Directors of an interim dividend without the sanction or direction of a general meeting; to amend, repeal, or re-enact with modifications section 63 of the Company's Act of 1876, and article 29 of the Scheme for the Amalgamation of the London Gas Company with the Company (confirmed by an Order in Council in 1883); and to declare that for the purposes of section 34 [Reduction of Standard Price and Amendment of Enactments Relating to Sliding Scale] of the Company's Act of 1909, any interim dividend so declared and paid in respect of any half year shall be deemed to be the dividend for that half year.

Managing Director.—To make provisions as to the appointment of a Managing Director or Managing Directors; and to prescribe or make provisions with reference to the terms and conditions on and subject to which the office may be held, and the powers to be exercisable by him or them and with reference to the remuneration or method of remuneration of any persons so appointed.

Provisions as to Reserve Fund and Removal of Certain Restrictions on Use.—To repeal section 11 [Use of Reserve Fund] of the Company's Act of 1903, and to authorize the use of the reserve fund for such purposes as are referred to in that section, but without limitation as to rate of dividend; to make further provisions with reference to the reserve fund and the formation, accumulation, amount, and application thereof; and to amend or repeal all or any of the provisions of the existing Acts of the Company relating to or affecting the fund.

Transfer of Stock to Company's Employees.—To make further provisions with reference to the transfer of stock of the Company to or by employees of the Company, and the registration of such stock, and the payment of moneys left in the hands of the Company by employees of the Company on account of any share in the profits of the Company or otherwise, and the appointment by any such employee of a nominee to transfer such stock or to receive such moneys on the death of such employee. To provide that any such nomination shall not become null or void by reason of the subsequent marriage or re-marriage of the employee making such nomination. To provide that the Company may register a transfer of stock into the name of an employee, although such transfer may have been executed by the transferor or transferors only, and that a transfer so executed shall constitute a legal conveyance to such employee of the stock therein referred to. To provide that where stock has been transferred to a nominee, such nominee (although under the age of 21 years) shall be competent to execute any subsequent transfer of such stock, and that a transfer so executed shall constitute a legal conveyance to the transferee of the stock therein mentioned. To amend, so far as may be necessary, the provisions of section 48 [Persons in Employ of the Gas Light Company may Nominate Others to Transfer Stock, &c., held by such Persons] of the Act of 1909 and the regulations contained in the fourth schedule to the Act.

SHEFFIELD GAS COMPANY'S POWERS.

Notice is given by the Sheffield United Gaslight Company of their intention to promote a Bill in the ensuing session of Parliament.

The Company are seeking, among other things, authority to convert, or provide for the conversion of, all or any of the stock, and to increase, alter, define, and regulate the capital and borrowing powers. The Bill will make new and further provision with reference to the dividends payable by the Company on all or any of their existing, converted, or new shares or stock, and the increase or decrease of such dividends on the whole or any class or classes of such shares or stock according to the prices charged for gas, or some of such prices.

They also ask to be empowered to create a sinking fund and a special purposes fund, and to make new provision with reference to the formation of a reserve fund; to change the name of the Company; to alter and define the powers with regard to the purchase of residual products used in, or arising from, the manufacture of gas, and of materials required for working-up and converting any such residual products; and to construct works. Further, the Company desire power to extend their limits of supply and to purchase coke-oven gas and gas in a crude and unpurified form, as well as to make provision with reference to the conditions to be observed in connection with the supply by the Company of gas for power, and with regard to the testing and inspection of anti-fluctuators for gas-engines, &c.

Corporation Not to Promote a Purchase Bill.

The Corporation have decided, says the "Sheffield Daily Telegraph," not to apply to Parliament for power to purchase the gas undertaking. For some years there has been a feeling among various leading citizens that the Company's property should be in the hands of the city; and it was felt that, in view of the fact that the Company proposed during the next session to promote a Bill for obtaining further powers, this might be a good opportunity for the Council to go to Parliament and ask them to transfer the gas undertaking to the city. The matter has been kept very quiet; and the fact that the Parliamentary Committee have been considering the question was only known to a limited number of people. A special meeting of the City Council was held on Friday to debate the whole subject. After a lengthy discussion, lasting over an hour-and-a-half, the Council decided not to proceed with a Bill, as the present was not considered to be an opportune time for taking such a step.

The Calorific Standard Order.

In the same issue of the paper, there appeared the following letter from a member of a leading Sheffield manufacturing firm, on the subject of the Calorific Standard Order recently granted to the Company by the Board of Trade [the full text of which will be found on another page].

The Sheffield Gas Company have such an excellent reputation, both for the efficiency of their plant and for the encouragement given to the application of gas for heating, that I think there is every prospect that a properly organized representation from the large users of gas for industrial heating would lead them to agree not to reduce the heating power of their gas to anything like the very low value which they are now permitted to adopt as a minimum standard. No one with any technical knowledge of the subject can offer opposition to the mere change from illuminating to heating standard; but the adoption of a standard as low as 500 B.Th.U. gross per cubic foot is, indeed, a most deplorable and serious thing—especially in Sheffield, where the applications of gas for industrial furnace heating have been so enormously extended.

The whole matter is rather difficult to discuss, as it is of such a specially technical nature. I am not a gas engineer; but I think I can safely contend that if Sheffield until within the last few months has been supplied with gas measuring between 570 and 558 B.Th.U. gross per cubic foot, the necessity of more completely removing such materials as benzol and toluol would account at the most for a drop of 20 units. So that, if other conditions are maintained, we ought still to be provided with a gas of (say) a minimum of 550 B.Th.U. The cause must certainly lie in another direction. Apparently the tendency in gas-works practice is to produce greater and greater volumes of gas per ton of coal, at the expense, however, of the richness of the gas. Some promise or undertaking from the Gas Company not to introduce or extend during the next five years special plant for producing water gas or other diluting gas mixture, for adding to the gas obtained by ordinary distillation methods, would certainly be most reassuring to the users. On the other hand, if such methods are adopted or extended, it would appear most unlikely that at the end of five years it would be possible to reconsider the Order in the spirit in which it appears to be given—*i.e.*, offering the possibility of returning to a supply of gas at the higher heating value.

Another point of great commercial importance is the relative value of high and low calorific standard gas in the heating of furnaces. The flame temperature, on which the intensity and rapidity of the heating of the gas depends, decreases very rapidly with a fall in the calorific value of the gas, with the result that, other conditions remaining the same, a furnace takes an enormously increased time to heat-up, and frequently fails to attain such a high temperature as was possible with the gas of higher heating value. This is the unfortunate daily experience of many gas users in Sheffield at the present time. Just exactly as an addition of oxygen to the air supplied to a flame enables work to be done by that flame quite beyond its usual range, so, conversely, robbing the gas of some of its heat-producing material reduces immediately its range of usefulness. It may be true that by modifying the construction of the furnace, or adopting some special kind of burner, the old conditions can be more nearly approached, but up to the present there is no suggestion that the Gas Company intend to replace for us all the furnace equipment they have in recent times been so eager in persuading us to instal.

SULPHATE OF AMMONIA AND ROOT CROPS.

Excellent Results Shown in Competition.

A copy of the awards and report of the Judges (Messrs. J. P. Jones and J. E. Bourne) in connection with the Patriotic Root Competition promoted by the Sulphate of Ammonia Association is to hand; and it is gratifying to note that the first prize in Class I., for the best four acres of mangolds, has been awarded to Mr. A. H. West, of Tutbury, with 90 tons 2 cwt. 2 qrs. 20 lbs. per acre. Mr. West is a son of Mr. John West, of Southport, whose paper to the Institution of Gas Engineers, in 1914, on "Lime and Sulphate of Ammonia as Fertilizers," will be remembered. There were four classes, and five prizes in each, the first prizes being: Class I. (mangolds), £50; Class II. (swedes), £50; Class III. (ox cabbage), £20; Class IV. (potatoes), £20.

The Judges, referring to the competition as a whole, testify to the excellence of the crops which came under their notice. The entries in the mangold class were twice as numerous as those they inspected last year, and contained exhibits from some of the most noted growers in the country. The mangolds, generally, they say, were all that could be desired; but the prize-winning crops were exceptional. In every case where a control plot was left untreated with sulphate a considerable difference in weight of produce per acre resulted, thus showing the great value of this manure when applied to a root crop. An estimation (in Class III.) shows that in the first five heaviest weights the advantage of 20 tons 6 cwt. per acre was the reward for the expenditure of an average of 2 cwt. of sulphate of ammonia and its distribution; and the competitors testify to the value of this manure. The control plots are most instructive, and form a practical illustration of the value of an application of sulphate of ammonia early in the spring.

NATIONAL GAS COUNCIL OF GREAT BRITAIN AND IRELAND

Established at a Conference of Representatives of the Institution of Gas Engineers, the British Commercial Gas Association, the Gas Companies' Protection Association, and the Society of British Gas Industries, held at the Westminster Palace Hotel on Oct. 3, 1916.

CONSTITUTION AND RULES.

Adopted at a Meeting of the Council held on Wednesday, the 15th of November, 1916, at the Caxton Hall, Westminster.

I.—NAME.

The name of the Association is the "National Gas Council of Great Britain and Ireland," and it is hereinafter referred to as the "Council."

II.—OFFICES.

The offices of the Council shall be in London.

III.—OBJECTS.

The objects of the Council are:

(A) To promote or defend the interests of the gas industry of the United Kingdom.

(B) To raise and administer funds for those purposes.

(C) To purchase, take on lease, or otherwise acquire, and also to dispose of, any houses or lands of any tenure or any real or personal property, rights or easements, for the purposes of the Council.

(D) To maintain, repair, enlarge, or otherwise alter or improve any buildings of the Council, and to build such new buildings as may be required for the purposes of the Council.

(E) To do all such other lawful things as may from time to time be incidental to or conducive to, the attainment of the above objects or any of them.

IV.—CONSTITUTION.

The Council shall consist of a President, Vice-Presidents, and Members.

(A) THE PRESIDENT.—(1) The President shall be selected for his eminence in the gas industry.

(2) The first President shall be elected by the General Consultative Committee, and shall continue in office until the annual meeting of the Council in the year 1917.

(3) Thereafter, the President shall be elected by the members, and his term of office shall be from the close of the annual meeting of the Council, at which such election takes place, until the close of the next annual meeting.

(4) The President shall be eligible for re-election.

(5) Nominations of candidates for the office of President must be sent to the Secretary on or before the 30th of September in any year, and must be signed by not less than four members of the Council.

(6) The General Consultative Committee shall have power to nominate a candidate for the office of President.

(7) If no nomination be received other than that of the candidate nominated by the General Consultative Committee, that candidate shall be submitted to the annual meeting for election by show of hands.

(8) If more than one nomination be received the names shall be submitted to the members of the Council on a ballot-paper not less than fourteen clear days before the annual meeting; and such ballot-papers shall be returned to the Secretary in sealed envelopes not later than two clear days before the day of the annual meeting. Ballot-papers shall be deposited unopened by the Secretary in a ballot-box which shall be opened on the morning of the annual meeting by Scrutineers appointed by the General Consultative Committee at their last previous meeting.

(B) VICE-PRESIDENTS.—The Vice-Presidents shall comprise the Presidents for the time being of the Institution of Gas Engineers, the British Commercial Gas Association, the Gas Companies' Protection Association, and the Society of British Gas Industries, and any others eminent in the gas industry whom the General Consultative Committee may elect.

(C) MEMBERS.—The members shall be: (1) The Presidents, Vice-Presidents, and Council for the time being of the Institution of Gas Engineers; (2) the President, Vice-Presidents, and General Committee for the time being of the British Commercial Gas Association; (3) the President and Committee for the time being of the Gas Companies' Protection Association; (4) the President, Vice-Presidents, and Council for the time being of the Society of British Gas Industries.

V.—THE CONSTITUENT BODIES.

The four bodies named in the last paragraph of the foregoing Rule IV. (C) are hereinafter called the "constituent bodies."

VI.—GENERAL MEETINGS OF THE COUNCIL.

(A) An annual general meeting of the Council shall be held in the last quarter of each year, at such time and place as may be determined by the General Consultative Committee, to receive the annual report and audited statement of accounts; to elect a President and Honorary Treasurer, two Honorary Auditors (one of whom must be a Member of the Institute of Chartered Accountants or a Fellow of the Chartered Institute of Secretaries, but need not be a member

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of the Council), and one or more Honorary Secretaries; and to conduct such other business as may be necessary. The first election of the officers herein mentioned shall be effected by the General Consultative Committee, and such officers shall hold office until the annual meeting, 1917.

(B) Ordinary or emergency general meetings of the Council shall be held at such times and in such places as may from time to time be fixed by the General Consultative Committee.

(C) Fifteen members shall be necessary to constitute a quorum at any general meetings of the Council.

(D) Notices of all general meetings shall be sent to every member of the Council at least seven clear days before the day of meeting, except in the case of emergency meetings, when such notice shall be given as the circumstances permit.

VII.—Committees.

Except as hereinafter provided, the work and powers of the Council shall be entrusted to a General Consultative Committee and an Executive Committee.

VIII.—General Consultative Committee.

(A) The General Consultative Committee shall consist of thirty-six members—being nine elected by each of the four constituent bodies. The members shall hold office for such period as may be respectively determined by the bodies by whom they are elected.

(B) The General Consultative Committee shall elect annually from amongst their members: (1) A Chairman; (2) a Vice-Chairman (being the Chairman for the time being of the Executive Committee); and (3) a Deputy-Chairman; and such Committee shall have power from time to time to fill any casual vacancy in any such office caused by the death or resignation of any person holding any such office, except in the case of the office of Vice-Chairman.

(C) The General Consultative Committee shall meet once in every three months, or as nearly thereto as may be convenient, and other meetings shall be held upon the initiative of the Executive Committee or upon requisitions addressed to the Secretary by any six members of the General Consultative Committee. At least seven clear days' notice shall be given, except in case of special urgency. Nine members shall form a quorum.

(D) The business of the General Consultative Committee shall be to receive, consider, and, if deemed expedient, take action upon, reports from the Executive Committee or requisitions received under the preceding clause of this rule; to discuss any question of common interest and importance to the whole industry and its allied trades, which, not being properly the business of any of the constituent bodies, may be raised by any member of the Committee as a matter of urgency at any of its meetings.

(E) The General Consultative Committee shall have power to incur expenditure for the purposes of the Council.

IX.—Executive Committee.

(A) The Executive Committee shall consist of twelve members, each of whom must be a representative of a gas undertaking (municipal or company) to be selected from time to time from the General Consultative Committee by the three first-named constituent bodies, and to continue in office for such period as may be determined by the bodies respectively by whom they are elected.

(B) In dealing with special matters or such as affect interests not directly represented on the Executive Committee, that Committee shall have power to co-opt for that purpose any member or members of the four constituent bodies or any other person or persons.

(C) The first Chairman of the Executive Committee shall be elected by the General Consultative Committee to hold office until the first meeting of the Executive Committee after the annual general meeting in 1917, and thereafter a Chairman shall be elected annually by the Executive Committee from amongst their members.

(D) The Executive Committee shall meet as and when necessary for the prompt transaction of business. Seven clear days' notice shall be given when possible, but the length of the notice given shall be governed entirely by the urgency of the business and the exigencies of the moment. Three members shall form a quorum.

(E) The business of the Executive Committee shall be to consider and to take such action as they may deem expedient, and subsequently to report to the General Consultative Committee, upon:

(1) Any matter of common interest and importance to the gas industry as a whole which is not properly the business of (or has not, after notice, been dealt with by) any of the three bodies represented on the Executive, on such matter being referred to it (*a*) by any of those three bodies or (*b*) by any member of the Council, or on the Chairman of the Executive being of opinion that the need for consideration and action has arisen; or

(2) Any matter of mutual importance to the gas industry and to any allied interest not represented upon the Executive Committee, on such matter being referred to it by any three persons representing such interest and the Chairman being of opinion that it is a matter with which the Executive Committee could and should deal.

(F) The Executive Committee shall have power to incur expenditure for the purposes of the Council not exceeding £200 per annum and such further sums as may from time to time be authorized by the General Consultative Committee.

X.—Secretary and Other Officers.

(A) The Secretary shall be appointed and his remuneration fixed by the Executive Committee.

(B) The Executive Committee may appoint such clerks and other members of the office staff as they may consider necessary, and fix their remuneration, or may make such other arrangements for the

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performance of the clerical work and payment therefor as they may deem expedient.

XI.—Trustees.

There shall be not less than two Trustees of the Council, who shall, in the first instance, be appointed by the General Consultative Committee to hold office until the annual meeting in 1917 and thereafter by the Council. Such Trustees shall be empowered to purchase and sell, hold, and dispose of, on behalf of the Council, real and personal property, and shall have full discretionary powers to invest any moneys in their hands in securities in which Trustees are empowered by law to invest trust moneys, and in the securities and shares and stocks, whether preference or ordinary, of any Railway, Dock, Gas, or Water Company incorporated by Royal Charter or Act of Parliament, or registered under the Joint-Stock Companies Acts.

XII.—Honorary Treasurer.

The Honorary Treasurer shall be responsible for the funds of the Council, except so far as they are held by, or invested in, the names of the Trustees.

XIII.—Accounts.

(A) The accounts of the Council shall be from time to time examined by the Executive Committee and the General Consultative Committee, and shall, after audit, be signed by the Chairmen of those Committees and submitted to the annual general meeting.

(B) Cheques on the banking account of the Council shall be signed by one member of the General Consultative Committee and by one of the Honorary Secretaries. This arrangement may be varied from time to time by resolution of the General Consultative Committee.

XIV.—Voting Power.

(A) The Chairman presiding at any meeting of the Council or any of its Committees shall have a casting vote in addition to his vote as a member.

(B) Every member attending a general meeting of the Council or any of its Committees shall be entitled to one vote.

(C) The Chairman of a meeting shall, in the first instance, if he thinks fit, take the decision of the meeting by voting by a show of hands; but any member present may demand a poll, which shall be taken at such reasonable time and place and in such manner as the Chairman may direct.

XV.—Minutes.

Minutes of the proceedings of all meetings of the Council and of its Committees shall be taken during their progress by the Secretary or some other person authorized by the Chairman, and they shall be properly recorded and read at the next meeting of the Council or Committee as the case may be, and, when confirmed, shall be signed by the Chairman of such subsequent meeting.

XVI.—Alteration of Rules.

Any alteration in, or addition to, these rules must be submitted by the General Consultative Committee to, and be approved by, three-fourths of the members present and voting at a general meeting of the Council. Notice of any proposed alteration of rules must be lodged with the Secretary not less than twenty-one clear days before the date of such general meeting.

XVII.—Registration, &c.

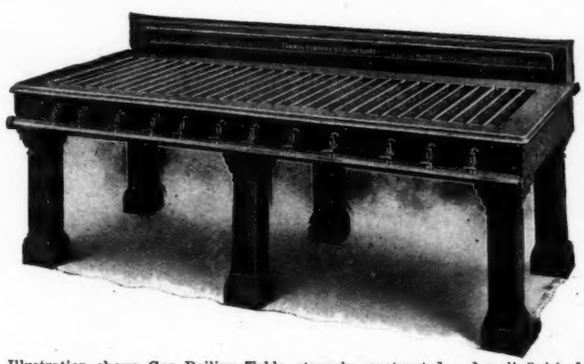
The Council shall have the right to apply for registration under section 20 of the Companies (Consolidation) Act, 1908, or for a Royal Charter.

CARBONIZING RESULTS AT WORKINGTON.

Woodall-Duckham Plant.—Effect of the Summer Time Act.

The Workington Town Council have adopted a unanimous recommendation of the Gas Committee that the thanks of the Council under seal should be given to Mr. Horace Chamberlain (the Gas Engineer and Manager) "for the very excellent manner in which he has carried out the large and important work of re-modelling and building the whole of the manufacturing plant of the gas-works; and that an honorarium be paid Mr. Chamberlain for the extra services which he has had to render in connection with the work." In submitting the minutes, Mr. Hall said the honorarium proposed was fifty guineas.

Reporting on the effect of the Summer Time Act on the quantity of gas sold during the six months ended Sept. 30, and the improved carbonizing results obtained, Mr. Chamberlain said: The total consumption in 1916 shows a decrease of 3,299,000 cubic feet, or 6·31 per cent. The consumption by public lamps in the corresponding period of 1915 was 2,124,556 cubic feet, leaving 1,174,444 cubic feet to be otherwise accounted for. The Summer Time Act was in operation for 132 days; and if we divide this into the balance of the decrease, we have an average of 8897 cubic feet per diem. This, divided by 4818, the total number of consumers, gives an average of 1·84 cubic feet per consumer per diem. Assuming each of these consumers reduced his consumption by one hour per diem during the period of 132 days on one burner consuming 4 cubic feet, the decrease would amount to 2,543,904 cubic feet. If this figure be substituted for the 1,174,444 feet, an increase of 1,369,460 cubic feet, or 2·62 per cent., would be obtained. This, I venture to submit, is exceedingly satisfactory considering many other towns have experienced a decrease of 10 per cent.; while Market Harborough has published an estimated decrease of 16 per cent. attributable to the Summer Time Act. With regard to the coal consumption for the period under review, we have produced 6·31 per cent. less gas with 12·52 per cent. less coal. The quantity of coal carbonized in the six months ending Sept. 30, 1915, was 4067 tons; whereas in 1916



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3549 tons have been used, a decrease of 508 tons. We have thus, by improved carbonizing results, and on account of stricter lighting restrictions, and the Summer Time Act, been able to exceed by 2·52 per cent. the 10 per cent. reduction in coal consumption asked for by the Government. On Oct. 5, 1915, the first portion of the new plant was put into operation; and on Oct. 13 the old plant was put out of action. We have thus completed twelve months' working of the new plant, for which period it was under the guarantee of the Contractors. During this time, the plant has given every satisfaction, and enabled us to obtain results from our coal which I do not think have been exceeded, if equalled, anywhere in the country. The Contractors' guarantee test of 12,500 cubic feet per ton has been exceeded by something like 1500 cubic feet; the actual yield in six months ended Sept. 30 being 13,721 cubic feet per ton. The whole of the work executed by the Woodall-Duckham Company has given every satisfaction; and the plant is in good working order in every way. I take this opportunity of expressing my appreciation of the excellent manner in which the Woodall-Duckham Company have conducted their business, especially when it is considered that they had to contend with difficulties never before experienced.

It was suggested by Mr. Chamberlain that before the expiration of the guarantee a representative of the Woodall-Duckham Company should thoroughly examine the plant. This was done by Mr. G. J. Jackson, who reported to the Company that the whole of the brickwork of the setting was in excellent condition; and in no case could he see in any of the combustion chambers the slightest sign of movement in any part of the brickwork. "This," he added, "is very satisfactory, in view of the high makes per ton that are being obtained at the present moment—viz., over 14,000 cubic feet. The plant generally is extremely clean and well kept, which indicates that it is receiving the necessary attention and care, in spite of the fact that the plant is being worked with a minimum number of men."

The Committee's minutes included a recommendation that the Council should take over the plant from the Woodall-Duckham Company, and an expression of their entire satisfaction with the way in which the contract has been carried out, and with the working results obtained.

CALORIFIC STANDARD IN NEW YORK STATE.

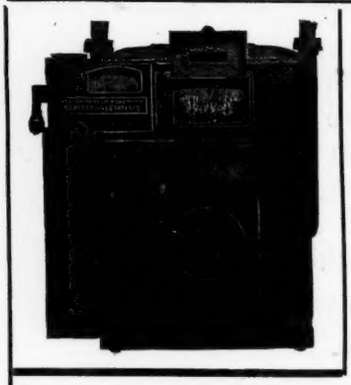
A calorific standard for testing gas has been established by the New York State Public Service Commission (Second District) for the territory under their jurisdiction; the minimum monthly average heating power being placed at 585 B.Th.U. Though only the upper section of the State is affected by this ruling, the "American Gaslight Journal" has good reason to believe that a similar step will shortly be taken by the Commission for the First District, making the calorific standard apply as far as New York is concerned.

The order of the Commission is to the effect that on and after Jan. 1 next all coal gas, carburetted water gas, and mixed coal and carburetted water gas, manufactured and sold by persons, corporations, and municipalities, in amounts exceeding 20,000,000 cubic feet per annum, for light, heat, or power, shall, when measured at the place provided for making the test, and corrected to a temperature of 60° Fahr. and a pressure of 30 inches of mercury, have a monthly average total heating power of not less than 585 B.Th.U. per cubic foot, and shall not for any three consecutive days in any such month average more than 5 per cent. below 585 B.Th.U. per cubic foot. The test to determine the heating value of the gas shall be made according to approved methods, within a two-mile radius of the manufacturing plant, at a location selected by the company or municipality and approved by the Commission—such location, however, to be subject to change by the Commission. Where manufactured gas is delivered to the mains at a pressure above 5 lbs. per square inch, it shall be tested for heating value before compression. Each 100 cubic feet of gas shall contain not more than 10 grains of ammonia, nor more than 30 grains of sulphur compounds.

Every person, corporation, and municipality selling gas to the public shall keep posted in the principal office, in a place readily accessible to the customers, a statement of the average daily heating power of the gas furnished during the preceding calendar month, in order that the consumers and the public may be advised of the quality of the gas being supplied. All such records shall be permanently retained by the respective compilers thereof, and shall be at all times available for examination by the Commission. Except as otherwise provided, the order of the Commission of Gas and Electricity made on June 15, 1907, and all other requirements relating to standards of heating power, illuminating power, and purity of gas manufactured and sold by persons, corporations, and municipalities for light, heat, or power purposes, are superseded by this order.

Any person, corporation, or municipality manufacturing and selling less than 20,000,000 cubic feet of coal gas, carburetted water gas, and mixed coal and carburetted water gas per annum for light, heat, or power, may, with the approval and consent of the Commission, adopt the standards created by, and become subject to the other provisions and requirements of, the order, precisely as in the case of persons, corporations, or municipalities manufacturing and selling in excess of 20,000,000 cubic feet per annum. The order is intended to relate only to the creation and establishment of a heat unit standard in place of the existing illuminating power standard for gas, and is not meant to in anywise affect tariff schedules, rates, or lighting contracts that may now be in force.

It will be seen from our advertisement columns to-day that Messrs. F. S. Airey, Entwistle, and Co., of Norfolk Street, Manchester, have received instructions, under the Trading with the Enemy Amendment Act, to sell by auction, on the 5th prox., the business of the Selas Company, Limited.



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MR. H. E. JONES'S "GAS ENGINEERS OF THE LAST CENTURY" LECTURE.

The Hawksley Lecture by Mr. H. E. Jones, which was summarized in the "JOURNAL" for Nov. 7 (p. 279), was similarly dealt with in the columns of the "Engineer;" and this has led to the subjoined letter being addressed to our contemporary by Mr. R. B. Prosser.

The following passage occurs in the report of Mr. Harry E. Jones's lecture: "In 1825, Whitehouse brought out a patent of Russell's dated 1817, for cheaply-made tube of greater length and uniform section of metal, welded by a patented process." No patent was granted to Russell in 1817; but Mr. Jones was probably thinking of Henry Osborn's patent granted in the same year for "producing cylinders of various descriptions." This was primarily intended for the manufacture of gun-barrels; but according to the "Mechanic's Magazine," Vol. XXXVI., p. 366, Osborn commenced to manufacture gas-pipes about 1820. The invention patented in 1825 by Cornelius Whitehouse (who was a workman in the employ of Russell) was entirely independent, and was of great importance. It was assigned to Russell, who had to bring many actions against infringers, in all of which he was successful. At the expiration of the patent in 1839, it was extended for six years. Whitehouse was paid an annuity of £300 during the life-time of the original patent, and £500 a year during the term of the extension. I should like to put these facts on record, in justice to the memory of Whitehouse, who died in 1883, in his eighty-ninth year. I have an interest in the matter, because my father, the late Richard Prosser, of Birmingham, was the real defendant in the case of *Russell v. Ledsam*—the patent in question being worked by the Birmingham Tube Company, with which Mr. Ledsam was connected. I greatly doubt whether old gun-barrels were used to any considerable extent for the conveyance of gas; for it must be remembered that they were small in bore, and not uniform, and that the external diameter at the breech end was greater than that of the muzzle, so that they must have been very troublesome to connect. Whitehouse's patent undoubtedly did much to extend the use of gas for lighting purposes. The same remark applies to the method of squirting lead-pipe, patented in 1820 by Thomas Burr, of Shrewsbury. I may remark, in passing, that Burr's invention was not quite new, as his method was described by Joseph Bramah in a patent which he obtained in 1797. As late as 1819 gas was looked upon with great suspicion; and Mr. J. W. Phipson, of Birmingham, took out a patent for safety gas-piping, consisting of an inner tube of lead, over which a casing of brass was drawn. Mr. Jones speaks of the disregard shown by the various competing gas companies to the rights of local authorities in regard to the opening of roads. But if he will look at the early Gas Acts, I think he will find that the powers of the companies in that behalf were very extensive.

CURRENT SALES OF GAS PRODUCTS.

LONDON, *Nov.* 20.

The London Market for Tar, Tar Products, and Sulphate.

The tone of the pitch market is good, and further business is reported at 21s. per ton net. Solvent naphtha, 90-160, is steady at 2s. 3d. to 2s. 4d. per gallon net and naked at makers' works. Creosote is unchanged at about 4d. per gallon net.

Sulphate of ammonia is in good demand, and the prompt export value for 25 per cent. quality is £17 12s. 6d. per ton net and naked at makers' works.

Tar Products in the Provinces.

Nov. 20.

The market for tar products remains about the same. Businesss in pitch is still very difficult, and there seems little chance of overcoming the difficulty at the present moment. Solvent naphtha is quiet, but prices are steady. There is no alteration in the value of creosote.

The average values of gas-works products during the past week were: Gas-works coal tar, 17s. to 21s. Pitch, East Coast, 16s. to 16s. 6d. per ton; West Coast—Manchester 15s. to 15s. 6d., Liverpool 16s. to 16s. 6d., Clyde 17s. to 18s. Benzol, 90 per cent., North, 10½d. to 11½d.; 50-90 per cent., naked, North, 1s. 3d. to 1s. 4d. Toluol, naked, North, 2s. 3d. Coal tar crude naphtha, in bulk, North, 6½d. to 6¾d. Solvent naphtha, naked, North, 1s. 10d. to 1s. 11d. Heavy naphtha, North, 1s. 2d. to 1s. 3d. Creosote, in bulk, North, 2½d. to 2⅝d. Heavy oils, in bulk, North, 3d. to 3¼d. Carbolic acid, 60 per cent., East and West Coasts, 3s. 4d. naked. Naphthalene salts, 70s. to 80s., bags included. Anthracene, "A" quality, 2¾d. to 3d. per unit; "B qualitp," ¾d. to 1d.

Sulphate of Ammonia in the Provinces.

LIVERPOOL, *Nov.* 18.

During the past week the tone of the market has remained very firm, although no quotable change has taken place in the values for November delivery. Demand from foreign countries has continued good; but actual business has been limited by the difficulties experienced in effecting shipments. The closing quotations for delivery this month are £18 per ton f.o.b. Hull, £18 2s. 6d. f.o.b. Liverpool, and £18 5s. f.o.b. Leith. For December, £18 5s. per ton f.o.b. good port has been paid, and for January-March £18 12s. 6d.

Sulphate of Ammonia.

From another source it is stated that this market is a little firmer. Outside London makes are £16 17s. 6d. to £17; Hull, £17 12s. 6d. to

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£17 15s.; Leith, £18; Liverpool, £17 17s. 6d.; Middlesbrough, £17 15s.

Nitrate of Soda.

This market has continued strong, and spot prices have advanced to 18s. per cwt. for ordinary quality and 18s. 6d. for refined.

COAL TRADE REPORT.

Northern Coal Trade.

The northern coal trade is a little brisker, though there is still a lack of steamers for prompt shipment. This makes the range of prices rather irregular, depending as they do in some degree on the arrivals of ready tonnage. There are more of the contracts that begin with the year in the market, both for home and foreign account. In the steam coal trade, prices vary for best Northumbrians from 29s. to 34s. per ton f.o.b.; for second-class steams, about 27s. 6d. is the current quotation; and steam smalls are from 19s. to 22s. 6d. In the gas coal trade, the market is firm, and the output is well taken up; the consumption being heavy. Home requirements are nearly at their fullest for the winter needs. Best Durham gas coals are quoted from 27s. 6d. to 30s. per ton f.o.b. Second-class gas coals are near 21s. to 23s. 6d.; and for "Wear Specials" the quotation is 30s. It is well known, however, that much of the coal is being sent out on long contracts that are at the "scheduled prices." A contract is in the market for 10,000 to 11,000 tons of very best Durham gas coals for Denmark. Some other contracts for home use are spoken of; but these will be under the Price Limitation Act. Freights are strong; and gas coal costs 14s. from the Tyne to London. Good gas coke is quoted from 33s. to 35s. per ton f.o.b. The rate of freight on coke for the northern ports of France is 41s. to 42s.

Effect of Labour Shortage at Drighlington.—The Drighlington Gas Company appealed before the local Tribunal, last week, for John Conley, a stoker, who was claimed to be indispensable and in a certified occupation. It was mentioned that the man had been employed for a number of years by the Company, but had lately been working for a contractor, who had obtained conditional exemption for him, and was willing to let him come to the gas-works. Mr. Schofield, for the Company, said they had had great difficulty in getting labour. They had advertised in all the local papers, and had applied at the Leeds and Bradford Labour Exchanges. Eight men engaged at different times had failed to turn up. The gas pressure had had to be reduced; and this was not satisfactory. They were now making 500,000 cubic feet a week less than they should be doing. Re-issue of a badge for this man was at present under consideration in London. Conditional exemption to Feb. 28 was granted.

Wages at Merthyr.—Having had submitted to him for arbitration a question as to wages to be paid at the Merthyr Gas-Works, Mr. H. Courthope Munroe, K.C., has awarded, as war wages, increases of 4s. per week to the stokers, 3s. to the carburetted water-gas operator, and 2s. 6d. to the boiler men and labourers.

East Molesey and the Calorific Standard.—At a meeting of the East Molesey District Council, the Clerk reported that he had lodged a representation with the Board of Trade that the Order asked for by the Hampton Court Gas Company with regard to a standard of calorific power, should be for the duration of the war only, and on condition that the public should receive a proper rebate in the price of gas.

Supply of Gas Coal in Paris.—There is a difference of opinion as to the quantity of coal available for use at the Paris Gas-Works. Speaking in the Chamber, M. Sembat declared that, thanks to the measures taken, the works were well furnished with coal, and that there was no fear of a failure to light the city. This, however, is disputed by M. Pierre Laval, Deputy of the Seine, who asserts that there is at the works only stock enough to last ten days.

Fixing of Gas-Fires at Nottingham.—Members were informed at a meeting of the Ironmongers' Trade Association at Nottingham that a letter had been written to the Gas Manager (Mr. J. Wilkinson) asking if he would revise his schedule of prices for the fixing of gas-fires. The reply was that he would allow members to add 20 per cent. to the schedule charges for materials, and would make a further allowance of 5s. towards the cost of fixing. This was considered to be insufficient, in view of the increased cost of labour; and it was decided to write him a further letter.

Expenditure on Mains, &c., at Stockport.—The printed minutes of the Stockport Gas Committee presented at the last meeting of the Town Council included a resolution that the following estimate of expenditure proposed to be incurred by the Committee, and for which borrowing powers are required, be submitted to the Finance Committee for them to report thereon to the Council: Mains and services (three years), £12,000; meters (three years), £12,000; stoves (three years), £4500—total, £28,500. And that the Finance Committee be requested to make application to the Local Government Board for sanction to borrow this sum.

Maintenance at Ossett.—The Ossett Corporation Gas Department have appointed an official to visit consumers, upon request, and clean and regulate incandescent burners, gas-cookers, gas-fires, &c., in return for a nominal payment. This is an innovation for the district; but local opinion holds that the service should be given free, partly because it is to the interest of any business concern to please a customer, and partly because the necessity of such attention is held to be due, not to any action or responsibility of the consumer, but to the naphthalene troubles in pipes and fittings which have developed since the gas became subject to tar-washing.

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Middlemen and Merchants and Coal Prices.

The District Coal and Coke Supplies Committee for Scotland are circulating a memorandum which states that representations have been made to the Board of Trade that the consumer at home, industrial and domestic, has not been receiving the benefit of the Price of Coal Limitation Act, due to a prevalent view that the middleman and coal merchant do not come within the provisions of the Act, and as the result of this, an unreasonable remuneration is being in many cases received. The Board of Trade take the view that the middleman and coal merchant come within the provisions of the Act; but in order to avoid the necessity for applying pressure to them, the Board have requested that consideration should be given to the whole question by the middlemen and coal merchants in Scotland, with a view to some voluntary agreement being entered into under which the remuneration to be received by these traders should be limited. The Board have therefore requested the Committee to interview representatives of these traders with the object of considering a voluntary arrangement with them which could be recommended to the Board for adoption. The Board have suggested that the maximum remuneration which should be allowed to all classes of middlemen and coal merchants should not exceed 1s. 6d. per ton. It is, however, not intended that the maximum remuneration should be charged in all cases; and the Board propose to reserve the right to investigate the circumstances in each particular case, with the view of determining whether the remuneration within the maximum is fair and reasonable.

Mishap at the Ilkeston Gas-Works.—While a purifier was being emptied at the Ilkeston Gas-Works, the bottom layer of oxide became ignited; and the fire brigade had to be summoned. The water which was poured on to the burning material, however, found its way into the mains, with the result that the supply of gas to the holders was temporarily cut off; and pumping operations had then to be undertaken to remove the water from the mains.

The Exemption of the Dawlish Gas Manager.—The case of Mr. H. Versey, the Manager of the local gas-works, was again referred to at the sitting of the Dawlish Tribunal yesterday week. The War Office had suggested that Mr. Versey's services might be dispensed with, and that his badge should be taken away. A letter was now read from the Ministry of Munitions stating that the Explosives Supply Department had made urgent representations that he should be allowed to remain, because of the importance of the work carried on at the gas-works in the production of toluol. It had therefore been decided that he should retain his badge until an effective substitute was found. The Chairman (Mr. J. H. G. Lamcraft) remarked that the Gas Company were advertising for a Manager. Mr. Hawking said the Company knew they could not get one. His opinion was that there were men at the works who could fill Mr. Versey's place. It was decided that the military authorities should have a copy of the letter, and be left to take any further action they considered desirable.

Hebden Bridge Gas Board.—At the monthly meeting of the Hebden Bridge and Mytholmroyd Gas Board, it was resolved that the stokers' wages should be advanced from 5s. 6d. to 5s. 10d. per eight-hour shift, and 6s. 1d. per twelve-hour shift, boilermen from 4s. 9d. to 5s. 1d. per hift, and yardmen and gas-fitters ½d. per hour. The Union have accepted these advances as satisfactory to them. The Clerk reported that he had purchased £1000 of gas stock for redemption purposes, at the rate of 65 per cent.

Government Control of Gas and Electricity in Sydney.—A message through Reuter's Agency, dated last Wednesday, stated that, as a result of the coal strike, the Government (acting under the powers conferred by the Emergency Bill which has been submitted to the Legislative Assembly), are assuming control of the gas and electricity supplies in Sydney, with a view to conserving the resources for necessary industries. It was estimated that 1500 factories, theatres, and newspaper offices, employing altogether 20,000 hands, would close on the following day in consequence. Under Government control, the supplies were expected to last for a fortnight; otherwise the electricity supply would have ceased on Monday of last week, and the gas on the Thursday.

Street Lighting in Glasgow.—In Scottish towns generally, more light is being given in the streets. Edinburgh has set the example; and other places include Perth and Arbroath. In Glasgow, the Town Council are discussing the advisability of having all public lamps painted white. The whole question of street lighting in Glasgow is under review at present; and arrangements are being made for a modification, as far as possible, of the restrictions. The Lighting Department have been inundated with advice and complaints from the general public; and a stage has been arrived at when it is necessary for the Corporation to grant the Lighting Committee a little power, to see if they can give greater satisfaction to the public. The Chief Constable is to approach the military authorities.

Oldham Gas-Workers' Wages Award.—The Oldham gas workers, along with other Corporation employees, were granted in August last year a war bonus of 2s. in the case of lower-paid men, and 1s. 6d. for those whose wages were about 31s. per week; and when the Union some months ago applied for a further advance for stokers, machine men, and labourers, the matter was referred to the Board of Trade for arbitration. Mr. W. H. Stoker, K.C., acted as Arbitrator; and his award is to the effect that, in lieu of the existing bonuses, and as from the third pay day in September, 1915, an advance of wages is to be granted according to the following scale: 5s per week to those whose wages are 30s. and under; 4s. to those whose wages exceed 30s. and do not exceed 45s.; and 3s. to those who earn over 45s. per week. The advances are to be regarded as war wages, and recognized as due to, and dependent on, the existence of the abnormal conditions now prevailing in consequence of the war. The claim for a permanent increase in wages is not sustained. The Union have now before the Corporation a wage claim for workmen in various other departments.

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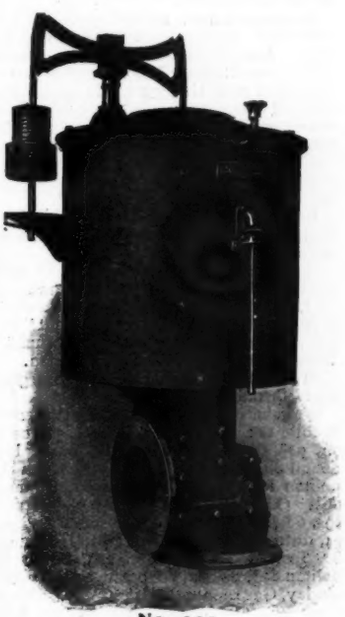

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Explosion while Repairing a Gas-Main.—When workmen from the Sunderland Gas Company had made an excavation near a shop occupied by a general dealer, at Southwick, for the purpose of remedying a leakage of gas from the main, a severe explosion occurred. The Gas Company's foreman (Robert Smith) sustained bad injuries; but the other workmen were not hurt. The house and shop were practically wrecked; and two women, with a boy who was making a purchase, were buried under the *débris*, and had to be taken to the hospital. It is thought that the accident was caused by the escaping gas becoming ignited by contact with the fire in the kitchen part of the premises.

Portsmouth Water-Works Company.—In their report to the shareholders for the half year ended Sept. 30, the Directors stated that there was an available balance on profit and loss account of £32,224, out of which the payment of the full statutory dividends was recommended, leaving a balance (subject to further payments of excess profits duty) of £12,097. An addition during the half year of seventy to the number of supplies, brought the total number of premises under constant supply throughout the whole of the Company's district up to 54,212, and the number of consumers to approximately 272,100. The quantity of water supplied for all purposes in the six months was 1,693,487,000 gallons.

Primitiva Gas Company and the Municipality.—In last Thursday's issue, "The Times" said they were informed that the statement published in various quarters that the dispute between the Primitiva Gas Company and the Municipality of Buenos Ayres had been settled is incorrect. "Apparently negotiations had been almost brought to a successful conclusion, when the Intendente of Buenos Ayres resigned, and until his successor has been appointed the matter must remain in abeyance. During the negotiations, the Municipal authorities, it is understood, agreed to allow the Company to increase the present gas tariff by 3 c. per unit. The Company asked for permission to raise the price by 3½ c.; but as the Municipality agreed to a reduction in the potency of the gas to 4000 calories, instead of 4200 as proposed by the Company, the request for a 3½ c. increase was virtually conceded. As regards the settlement of the debt owing by the Municipality to the Company, the former agreed to a remission of certain taxation which would have been equivalent to a cash purchase of $330,000, and also to issue to the Company $2,000,000 of 7 per cent. Municipal bonds. Agreement had also been reached on other matters, but at the crucial moment, apparently, the Intendente resigned. It will be recalled that, owing to the failure of the Municipality to pay their gas bill, amounting to about £150,000, the preference dividend of the Company which fell due in July could not be paid."

STOCK MARKET REPORT.

THERE was no very remarkable change last week in the general characteristics of affairs on the Stock Exchange from what prevailed the week before. As then, so now, the universal complaint was that business was a great deal too quiet; and there does not appear to be any immediate prospect of an end being put to this state of stagnation, and of a welcome return to at least something like an approach to conditions of normal activity.

Most opinions are in agreement that nothing really effectual can be expected so long as that inscrutable problem, the new War Loan, remains hanging in the air. There must be plenty of money about, ready for investment as soon as the clouds of doubt and uncertainty are cleared away; but till then, the public seem resolved to take no big risks. In these conditions, business jogged along very quietly—now a shade brighter, now a shade duller—just as some minor factor was touching a market favourably or the reverse. Rather more than usual sensitiveness to war news was apparent—cheered by our victory on the Ancre, and countered by the Roumanian retirement in the Carpathians.

In Government securities, the War Loan oscillated, gaining ½ one day and losing it the next; but the tone at the close was steady. The Home Railway Market was almost wholly neglected until Undergrounds were seen to be in good demand upon the prospect of important developments. Americans, after some fluctuations, took a stronger line; but Canadians were dullish. Argentines were depressed by news regarding crops; and the prevailing tone of South was easier.

In the Foreign Market, the French Loan was firmer and Japanese improved. Miscellaneous were inconstant.

Business in the Gas Market was quite languid; and the general tendency, lacking support, was easier. A hitch appears to have arisen in the reported "arrangement" between the Primitiva Company and the Municipality. What it amounts to needs elucidation.

In the Money Market there was a good demand throughout the week.

Bargains done for cash during the week were as follows: On Monday, Gas Light ordinary, 74, 74¾, ditto preference 69⅞, Imperial Continental 80, South African 6⅝, 6¾, South Metropolitan 84¼, ditto debenture 60, Swansea 86, 86½. On Tuesday, Bombay 5¼, Cape Town 29s. 6d., 30s., Gas Light ordinary 73⅛, 73⅝, 74, ditto maximum 56⅛, Imperial Continental 80, Ipswich 10 per cent. 225, South Metropolitan 84¼, 85, ditto debenture 59½. On Wednesday, Gas Light ordinary 72⅛, 73⅛, ditto maximum 56¼, 57, ditto debenture 60, Imperial Continental 80, 80⅛, 81, South Suburban 81, 81⅛, ditto debenture 90. On Thursday, Gas Light ordinary 73, 73⅛, 73⅜, Imperial Continental 80, 80⅛, Primitiva 40s. 3d., ditto preference 65s., South Metropolitan 84¼. On Friday, Gas Light ordinary 72⅛, 73, ditto debenture 59, Imperial Continental 79, 80, 81, Primitiva 40s., 41s. 3d., ditto preference 62s. 6d., South Metropolitan 83¼, South Suburban debenture 88⅛. On Saturday, Alliance and Dublin 63⅜, 63¾, 64 11/16. Brighton original 160, Chester 82, Gas Light ordinary 72½, 72⅝, 73, ditto debenture, 59½. Primitiva 40s.

The Bank rate is 6 per cent.—as fixed on July 13.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S BARGAINS.

Issue.	Share.	When ex-Dividend.	Previous Dividend & Bonus.	Last Dividend.	NAME.	Closing Prices. July 26, 1914.	Present Prices.	Lowest and Highest Prices of Bargains.
£			p.c.					
175,472	Stk.	Mar. 10	4	4%	Aldershot 4 p.c. Pref.	..	65—70	..
1,551,868	,,	April 8	2½	5⅛%	Alliance & Dublin Ord.	59—64	62—64	63⅜—64 11/16
374,000	,,	July 10	4	4%	Do. 4 p.c. Deb.	76—79	60—65	..
280,000	5	April 29	7½	4/6	Bombay, Ltd.	5⅛—6⅜	4⅞—5⅜*	5⅛
50,000	10	Feb. 26	16	15/-	Bournemouth Gas and Water: 10 p.c.	29—30	26—27	..
888,110	10	,,	7	7/-	Bournemouth Gas and Water: B 7 p.c.	15—15½	11—11½	..
115,000	10	,,	6	6/-	Bournemouth Gas and Water: Pref. 6 p.c.	13½—14	9½—10	..
159,740	—	—	—	4%	Bournemouth Gas and Water: 4 p.c. Deb.	..	73—75	..
992,045	Stk.	Feb. 26	†14	55/-	Brentford A Consold.	261—266	86—88	..
734,920	,,	,,	†11	53/9	Do. B New	204—209	83—85	..
55,000	,,	,,	5	5%	Do. 5 p.c. Pref.	109—111	85—90	..
221,400	,,	June 11	4	4%	Do. 4 p.c. Deb.	91—93	69—71	..
217,880	Stk.	Feb. 26	11	10⅜%	Brighton & Hove Orig.	208—213	165—168	160
244,200	,,	,,	8	7½%	Do. A Ord. Stk.	154—159	121—124	..
580,000	20	Mar. 26	12½	22/6	British	44—45	34—35	..
120,000	Stk.	June 26	4	4%	Do. 4 p.c. Deb. Stk.	88—90	68—70	..
245,771	Stk.	June 26	4	4%	Buenos Ayres 4 p.c. Deb.	85—87	60—65	..
100,000	10	—	—	—	Cape Town & Dis., Ltd.	1¾—2½	1¾—1¾	29/6—30/-
100,000	10	—	—	4½%	Do. 4½ p.c. Pref.	4—6	4½—5½	..
100,000	Stk.	June 26	4½	4½%	Do. 4½ p.c. Deb. Stk.	70—75	60—65	..
157,150	Stk.	Feb. 26	5	5%	Chester 5 p.c. Ord.	108—110	82—83	82
1,518,280	Stk.	Feb. 12	5/9/4	49/4	Commercial 4 p.c. Stk.	106—108	72—74	..
560,000	,,	,,	5½	46/8	Do. 3½ p.c. do.	103—105	68—70	..
475,000	,,	June 11	3	3%	Do. 3 p.c. Deb. Stk.	69½—71½	55—57	..
800 000	Stk.	,,	4	—	Continental Union, Ltd.	76—79	36—38	..
200 000	,,	,,	7	—	Do. 7 p.c. Pref.	115—118	57—59	..
278,400	—	—	—	11½%	Croydon B and C 7 p.c.	..	175—185	..
—	—	—	—	10%	Do. E	..	..	..
492,270	Stk.	—	6	5⅞%	Derby Con. Stk.	122—125	100—105	..
55,000	,,	—	4	4%	Do. Deb. Stk.	102—104	80—83	..
1,002,180	10	July 29	10	7/6	European, Ltd.	17½—18	12—13	..
16,318,430	Stk.	Feb. 10	4/17/4	42/-	Gas Light and Coke: 4 p.c. Ord.	99—102	72—74	72½—74½
2,600,000	,,	,,	3½	3½%	Gas Light and Coke: 3½ p.c. max.	76—79	55—58	56½—57
4,062,235	,,	,,	4	4%	Gas Light and Coke: 4 p.c. Con. Pref.	96—99	63—71	69½
4,674,850	,,	June 11	8	8%	Gas Light and Coke: 8 p.c. Con. Deb.	72½—74½	59—61	59—60
130,000	,,	,,	10	10%	Gas Light and Coke: 10 p.c. Bonds	..	..	..
258,740	Stk.	Mar. 12	5	4½%	Hastings & St. L. 3½ p.c.	87—89	78—83	..
70,000	10	April 29	11	6%	Hongkong & China, Ltd.	16½—16⅞	8—9	..
86,600	—	—	—	9½%	Hornsey 7 p.c.	..	125—135	..
131,000	Stk.	Mar. 12	7⅛	7⅛%	Ilford A and C	151—154	112—117	..
65,780	,,	,,	6⅜	6⅜%	Do. B	116—119	103—108	..
65,500	,,	June 26	4	4%	Do. 4 p.c. Deb.	92—94	73—76	..
4,940,000	Stk.	May 14	9	4½%	Imperial Continental	150—160	78 83	79—81
1,235,000	Stk.	Feb. 12	3½	3½%	Do. 3½ p.c. Deb. Red.	84—86	65—67	..
235,242	Stk.	Mar. 12	6½	6½%	Lea Bridge Ord. 5 p.c.	119—121	87—92	..
2,498,905	Stk.	Feb. 26	10	5%	Liverpool 5 p.c. Ord. A	211—213	87—88	..
					Liverpool 5 p.c. Ord. B	146—148		
306,083	,,	June 26	4	4%	Do. 4 p.c. Pr. Deb. Stk.	..	75—77	..
15,000	5	June 11	6	2/-	Malta & Mediterranean	4¼—4⅝	4—4½	..
250,000	100	April 1	4½	4½%	Met. of Melbourne 4½ p.c. Deb.	99—101	89—93	..
541,920	20	May 28	4	6/-	Monte Video, Ltd.	11⅛—12	8⅞—9½	..
1,875,892	Stk.	July 29	4½	4½%	Newc'tle&G'tesh'd Con.	98¾—99½	79⅛—80⅜	..
529,705	Stk.	June 26	3½	3½%	Do. 3½ p.c. Deb.	82—83	75—77	..
55,940	10	Feb. 26	7/14/0	7/8⅝	North Middlesex 7 p.c.	14—15	10½—11⅜	..
300,000	Stk.	May 14	8	8%	Oriental, Ltd.	117—122	108—110	..
60,000	5	Mar. 26	10	1/-	Ottoman, Ltd.	7½—7⅞	2—3	..
60,000	50	Feb. 26	18	12%	Portsea, Island B	128—131	95—100	..
100,000	50	,,	12	11%	Do. C	118—121	88—93	..
52,000	50	,,	10	9%	Do. D	..	..	..
249,980	5	April 29	8	—	Primitiva Ord.	5¼—6	2—2¼	40/—41/3
499,960	5	June 26	5	2/6	,, 5 p.c. Pref.	4⅝—5	3—3½	62/6—65/-
521,600	100	June 2	4	4%	,, 4 p.c. Deb.	91—98	80—82	..
—	—	—	—	4%	,, ,, ,, 1911	..	..	..
340,198	Stk.	June 26	4	4%	River Plate 4 p.c. Deb.	85—87	63—68	..
150,000	10	May 14	6	6/-	San Paulo 6 p.c. Pref.	10½—11	8—8½	..
125,000	50	July 1	5	5%	San Paulo 5 p.c. Deb.	47—49	43—45	..
135,000	Stk.	Mar. 12	10	10%	Sheffield A	238—324	188—192	..
309,984	,,	,,	10	10%	Do. B	238—324	188—192	..
538,500	,,	,,	10	10%	Do. C	230—322	188—192	..
90,000	10	May 28	9	6/-	South African	10½—11½	..	63—63½
6,609,895	Stk.	Feb. 10	5/4/0	44/-	South Met., 4 p.c. Ord.	111—113	83—85	83½—85
1,895,445	,,	July 10	3	3%	Do. 3 p.c. Deb.	73½—74½	59—61	59½—60
224,890	Stk.	Feb. 26	8½	8%	South Shields Con. Stk.	157—159	145—147	..
952,795	Stk.	Feb. 26	6	48/4	S'th Suburb'n Ord. 5 p.c.	114—116	80—82	81—81½
60,000	,,	,,	5	5%	Do. 5 p.c. Pref.	110—112	79—81	..
135,000	,,	—	—	48/4	Do. West Kent.	..	..	..
187,558	,,	June 26	5	5%	Do. 5 p.c. Deb. Stk.	116—118	90—92	88½—90
647,740	Stk.	May 14	5	5%	Southampton Ord.	99—102	88—93*	..
190,000	Stk.	Feb. 12	7⅛	7⅛%	Tottenham District: A 5 p.c.	185—188	120—123	..
782,275	,,	,,	6	5⅞%	Tottenham District: B 3½ p.c.	116—117	90—92	..
181,255	* ,,	June 26	4	4%	Tottenham District: 4 p.c. Deb.	87—89	73—75	..
182,380	10	Dec. 30	5	—	Tuscan, Ltd.	5—6	1—2	..
149,900	10	July 1	5	5%	Do. 5 p.c. Deb. Red.	93—95	60—65	..
236,476	Stk.	Mar. 12	5	5%	Tynemouth, 5 p.c. max.	103½—109½	91—92	..
					Wandsworth, Wimbledon, and Epsom—Wandsworth A 5 p.c.	151—156	117—122	..
80,000	Stk.	Feb. 26	8⅜	7⅞/9	,, B 3½ p.c.	122—124	101—103	..
265,636	,,	,,	6⅞	6⅜/9	,, C 3½ p.c.	110—115	88—93	..
108,076	,,	,,	5/17/8	55/1½	Wimbledon 5 p.c.	117—122	90—95	..
852,000	,,	,,	6¾	6⅞/6	Epsom 5 p.c.	121—126	98—103	..
98,000	,,	,,	6⅜	6⅜/9	5 p.c. Deb. Stk.	66—69	53—56	..
88,416	,,	June 26	8	8%				

* Ex. div. † Paid on Old 10 p.c. and 7 p.c. Standard Stocks.

At Sedgley, it is reported that for the current year 3,383,000 cubic feet of gas less has been made than in the previous year; this having been chiefly due to the lighting restrictions in operation.

"Giant Gas-Engines" is the title of a bulletin to hand from the Chicago Pneumatic Tool Company. It deals with a type of engine made to run satisfactorily on any manufactured or natural gas containing 600 B.Th.U. or more per cubic foot. The numerous advantages claimed for the general design—horizontal, straight line—are set out, the letter-press being accompanied by a number of illustrations.

The Leeds Corporation General Purposes Committee, in reply to the Local Government Board inquiry as to works which can be undertaken locally after the war, have prepared a return of prospective expenditure amounting to close upon two millions sterling, which is classified under the headings of "urgently necessary," "desirable at an early date," and "less important"—the first absorbing more than half the cost. The gas undertaking comes in for a prospective expenditure of £85,000; but the electricity department is estimated to require, by that time, the spending of £418,000, with an additional £50,000 for tramway renewals.

Advice has been received from Sydney of the intention of the Government, under the War Precautions Act, to prohibit the use of raw tar for road purposes; the object being to secure for shipment to this country all the benzol and toluol possible. It was also desired to establish throughout the Commonwealth the production of carbolic acid and other bye-products of which a shortage is now experienced.

The annual meeting of the division formed at the Redheugh works of the Newcastle-upon-Tyne and Gateshead Gas Company, in connection with the St. John Ambulance Brigade, was lately held in the ambulance room at the works. Superintendent J. F. Fowler presided, and was supported by Mr. Thomas Hardie (the Chief Engineer of the Company), Mr. Norman Reid (the Manager of the works), and Dr. A. Dougal, Hon. Divisional Surgeon. Mr. W. D. Brown (Divisional Secretary) presented his report, which stated that it had been a very busy year; 190 first-aid cases having been treated at the works. Mr. Reid presented Dr. Dougal with a tea set; and Mr. Hardie presented medallions to eleven members. Incidentally, he mentioned that he had just heard that Corporal Rust, one of their members, had been awarded the Military Medal. Superintendent Fowler, on behalf of the members, presented a fountain pen to Mr. Brown.

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments, &c., Vacant.

CLERK. No. 6244.
CLERK-STOREKEEPER. No. 6242.
GAS-FITTER. 6243.
STOKER. King's Lynn Gas-Works.
CHIEF CLERK. Exmouth Gas-Works. Applications by Nov. 30.

Appointments, &c., Wanted.

EXPERT ADVICE ON BENZOL, AMMONIA, AND OTHER DISTILLING PLANT. No. 6241.

Second Hand Plant, &c., Wanted.

GASHOLDERS. No. 6239.

Trading With the Enemy Act Sale.

SELAS COMPANY, LIMITED. By Auction, at Manchester. Dec. 5.

Patent Licence, &c.

MANTLE MANUFACTURE. Haseltine, Lake, and Co., 28, Southampton Buildings, W.C.

Wanted to Purchase.

CARBON. No. 6192.

TENDERS FOR

Coal.

NOTTINGHAM WORKS AND WAYS COMMITTEE. Tenders by Nov. 30.

Fire-Clay Goods.

BRADFORD CORPORATION. Tenders by Nov. 30.

General Stores and Materials.

NOTTINGHAM WORKS AND WAYS COMMITTEE. Tenders by Nov. 20.

Tar, &c.

NOTTINGHAM WORKS AND WAYS COMMITTEE. Tenders by Nov. 30.
SHOTLEY BRIDGE AND CONSETT GAS COMPANY. Tenders by Dec. 6.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer—not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders to Alter or stop PERMANENT ADVERTISEMENTS should be received by the FIRST POST on Saturday.

Wanted, For Sale, and Tender Advertisements, Six Lines and under 3s.; each additional Line, 6d.

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For GAS PURIFICATION.
LARGEST SALE OF ANY OXIDE.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

GAS PURIFICATION & CHEMICAL CO., LD.,
PALMERSTON HOUSE,
OLD BROAD STREET, LONDON, E.C.

"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for Gas-Works.
ANDREW STEPHENSON, Gresham House, Old Broad Street, LONDON, E.C. "Volcanism, London."

SEND your inquiries for Carburetted HYDROGEN AND BLUE WATER-GAS PLANT, also TAR DEHYDRATING PLANT and other GAS-WORKS APPARATUS to—

BALE AND HARDY,
89, VICTORIA STREET, WESTMINSTER, S.W.

SULPHURIC ACID.

SPECIALLY prepared for the manufacture of SULPHATE OF AMMONIA.
SPENCER CHAPMAN & MESSEL, LTD., with which is amalgamated WM. PEARCE & SONS, LTD., 86, Mark Lane, LONDON, E.C. Works—SILVERTOWN.
Telegrams—"HYDROCHLORIC, FEN. LONDON."
Telephone—1588 AVENUE (3 lines).

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 45 & 47, Westminster Bridge Road, London, S.E.
WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS AND GOVERNORS.
REPAIRS RECEIVE PROMPT ATTENTION.
Telephones: 815 Oldham, and 2412 Hop, London.
Telegrams—
"BRADDOCK, OLDHAM," and "METRIQUE, LAMB LONDON."

ALDER AND MACKAY
(ESTABLISHED 1850),
WET AND DRY METERS.
SLOT AND ORDINARY.
STREET LAMPS AND AUTOMATIC CONTROLLERS.
EDINBURGH.

TAR AND GAS LIQUOR WANTED
IN LONDON DISTRICT.

THOMAS CLAYTON (Oldbury) Ltd.,
BRENTFORD, W.
Telegrams: Canal Brentford. 'Phone: Ealing 17.

R. & G. HISLOP,
GAS ENGINEERS, RETORT BUILDERS, CONTRACTORS, &c.
RETORT SETTINGS, COAL TESTING PLANT, BOILER FIRING.
Communications should be addressed to UNDERWOOD HOUSE, PAISLEY.

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We are in a position to Supply Oxide of Iron promptly, and invite Enquiries.
SPENT OXIDE WANTED.
BALE & CHURCH, LTD.
5, CROOKED LANE, LONDON, E.C.

"TORTO" FIRE CEMENT.
BALE & CHURCH, LTD.
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Tins for sale to Consumers.
In Bulk for Works Use.
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D. ANDERSON AND COMPANY,
GAS LIGHTING ENGINEERS AND CONTRACTORS.
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Telegrams: "DAYLIGHT LONDON." Telephone: 2336 HOLBORN.

"FERROX." "FERROX." "FERROX."
A BRITISH Oxide Cheaper and Better than Bogore. 35 per cent. Water, 75 per cent. Ferric Hydrate. For Sale outright or on Loan.
OXIDE LIMITED, Brentford, MIDDLESEX.

SPENCER'S Patent Inclined HURDLE GRIDS.

THE very best Patent Grids for Holding Oxide Lightly.
See Illustrated Advertisement, on p. 372.

ROBERT DEMPSTER & SONS, Ltd., Contractors for Complete CARBONIZING PLANTS and every Description of GAS APPARATUS, ELEVATING, CONVEYING, and TELPHERAGE PLANTS, also STOKING MACHINERY, Ross Mount Ironworks, Elland.

MEWBURN, ELLIS, AND PRYOR.

CHARTERED PATENT AGENTS AND TRADE MARK AGENTS,
70, Chancery Lane, London.
Telegrams: "Patent London." 'Phone: 243 Holborn.
And 8, St. Nicholas Buildings, Newcastle-on-Tyne.

SULPHATE OF AMMONIA SATURATORS and all LEAD and TIMBER WORK in connection with Sulphate Plants.
We Guarantee promptness with efficiency for Repairs.
Joseph Taylor and Co., Central Plumbing Works, Bolton.
Telegrams—"Saturators Bolton." Telephone 0848.

WELL-KNOWN Expert offers ADVICE and ASSISTANCE to Gas Engineers contemplating Installation of Benzol Plants, Direct Recovery of Ammonia, Tar Distillation, &c., at reasonable Terms.
Write, in first instance, to No. 6241, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

WANTED—Chief Clerk, able to Take Control of Rentals, Ledgers, &c.
Applications, stating Age, Experience, and Salary required, with *Copies* of Testimonials, to W. E. Dean, Engineer and Secretary, Gas-Works, Exmouth, Devon not later than Nov. 30, 1916.

GAS STOKER wanted at once, used to Shovel Charging. Piece Work Rates and War Bonus, average 45s. per Week.
Apply, stating Age and Particulars, to The Engineer, Gas-Works, Kings Lynn.

WANTED, at once, Clerk-Storekeeper for Gas and Water Company in South Wales. Must have good knowledge of Storekeeping. Quick and accurate. Ineligible for Service.
Apply, by letter, with *copies* of References, and stating Salary required, to No. 6242, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

WANTED—Gas-Fitter able to assist in Water Inspection. Must be Ineligible for Service.
Apply, by letter, stating Age, Experience, and Wages required, to No. 6243, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

WANTED, for a North Suburban Gas Company, an Experienced CLERK (over Military Age), accustomed to Gas Office Routine, particularly Rental.
Apply, by letter, stating Salary required and Experience, to No. 6244, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

GASHOLDERS wanted, with or without Iron or Steel Tanks, from 50,000 to 200,000 Storage Capacity. Buyer to Remove. If fit for re-erection, good prices can be given.
Address No. 6239, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

GAS-WORKS requiring Extensions should Communicate with FIRTH BLAKELEY, SONS, AND CO., LIMITED, Dewsbury, who make a Speciality of Catering for the Smaller Gas Concerns. Prices Reasonable; quality and results, the best. Satisfaction Guaranteed.

WANTED—Good, Clean, and Hard CARBON, in Four-Ton Lots, or more, f.o.r.
Address, No. 6192, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

"JOURNALS" WANTED.

NOS. 2275, 2302, and 2419 of the "Journal" wanted to Purchase.
G. E. Stechert and Co., 2, Star Yard, Carey Street, Chancery Lane, London, W.C.

J. E. C. LORD, Ship Canal Tar-Works, Weaste, Manchester. Pitch, Creosote, Benzols, Toluol, Naphtha, Pyridine, all kinds of Cresylic Acid, Carbolic Acid, Sulphate of Ammonia, &c.

DEFENCE OF THE REALM ACT.

TO comply with Regulation 8 (*b*) of the above Act, advertisements from firms whose business consists wholly or mainly in Engineering, Shipbuilding, or the production of Munitions of War, or of substances required for the production thereof, must include the words "No person resident more than ten miles away or already engaged on Government work will be engaged."

Advertisers should also make note that the taking of steps to obtain the services of an alien for work other than munitions work in the United Kingdom is prohibited except with the permission of the Board of Trade.

CITY OF BRADFORD.

TO RETORT MANUFACTURERS.

THE Bradford Corporation invite TENDERS for the Supply of GAS-RETORTS and of FIRE-BRICKS and FIRE-CLAY required in the fixing of such Retorts during the year 1917.
Form of Tender may be obtained on Application to Mr. Chas. Wood, Gas Engineer, Town Hall, Bradford.
Tenders, endorsed "Tender for Retorts," to be sent to me so as to arrive not later than 9 a.m. on Thursday, the 30th inst.
The Contract will be let subject to the Fair Contracts Clauses of the Corporation.
The lowest or any Tender will not necessarily be accepted.

Frederick Stevens,
Town Clerk.

Town Hall, Bradford, Nov. 15, 1916.

SHOTLEY BRIDGE AND CONSETT DISTRICT GAS COMPANY.

TENDERS FOR TAR.

THE Directors of this Company invite TENDERS for the Purchase of the TAR Produced at their Works from the 1st of January to the 31st of December, 1917.
Quantity, about 80,000 Gallons. Contractor to find his own Casks and to accept Delivery at Blackhill Station.
Tenders to be sent to the undersigned not later than Wednesday, Dec. 6, 1916.

M. Richley,
Secretary.

Gas Offices, Front Street,
Shotley Bridge.

CITY OF NOTTINGHAM.

THE WORKS AND WAYS COM- MITTEE are prepared to receive TENDERS for the Supply of the undermentioned STORES and MATERIALS; the Contracts to commence on the 1st of January next, and to terminate on the 31st of December, 1917:—

A.—CEMENT.
B.—BLUE LIAS LIME.
C.—RED BRICKS.
D.—BLUE BRICKS.
E.—TIMBER.
F.—STONEWARE PIPES, &c.
G.—STONEWARE PIPES, &c. (Patent Joints).
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J.—GRANITE SETTS, KERB, and BROKEN GRANITE.
K.—IRONSTONE SLAG, CHIPPINGS, &c.
L.—RIVER GRAVEL.
M.—COAL.
N. PICKS, SHOVELS, SCOOPS, &c.
O.—IRONMONGERY.
P.—SCAVENGING and other BRUSHES.
Q.—DISINFECTANTS.
R.—REFINED TAR.
S.—PITCH.
T.—CREOSOTE OIL.

Forms of Tender may be obtained on applying to Mr. Arthur Brown, M.Inst.C.E., City Engineer, Guildhall, Nottingham, on payment of a deposit of 5s. each, which will be returned on receipt of a *bona fide* Tender, in accordance with the Specifications, providing such Tender is not withdrawn, and is Delivered by the time stated below.
Patterns and Samples may be inspected at the Eastcroft Depot, London Road, Nottingham.
The Committee will not consider any Tender except on the authorized Form of Tender, which must be delivered to the undersigned, in the official envelope provided, on or before Thursday, the 30th of November, 1916.
The lowest or any Tender will not necessarily be accepted, and Tenders will only be accepted from persons who conform to the Conditions as regards paying the local Standard Rate of Wages, &c., and to the working rules of the Nottingham District applicable to the various trades.

By Order,
W. J. Board,
Town Clerk.

Guildhall, Nottingham,
Nov. 10, 1916.

SALES BY AUCTION OF GAS AND WATER-STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to notify that their SALES BY AUCTION of NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at THE MART, TOKENHOUSE YARD, E.C.
Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to Messrs. A. & W. Richards, at 37, Walbrook, E.C.

THE Proprietors of the Patent No. 683 of 1915 for "IMPROVEMENTS IN APPARATUS FOR THE MANUFACTURE OF INCANDESCENT GAS-MANTLES," are desirous of Entering into Arrangements, by way of a LICENCE and otherwise, on Reasonable Terms, for the purpose of EXPLOITING the same and Ensuring their Full Development and Practical Working in this Country.
All Communications should be addressed in the first instance to Haseltine, Lake, and Co., Chartered Patent Agents, 28, Southampton Buildings, Chancery Lane, London, W.C.

TRADING WITH THE ENEMY AMENDMENT ACT, 1914.

RE SELAS COMPANY, LIMITED.

F. S. AIREY, ENTWISTLE, AND CO. have received Instructions from the Controller, Mr. John P. Garnett, to SELL BY AUCTION, at the Albion Hotel, Piccadilly, Manchester, on Tuesday, the 5th day of December, 1916, at 3.30 for 4 o'clock in the afternoon, subject to the General Conditions of Sale of the Manchester Law Society and to the Special Conditions which may be inspected Ten days prior to the Sale—
The well-established Business of:—

SELAS COMPANY, LIMITED.

(*a*) The GOODWILL OF THE BUSINESS of Gas Lighting and Heating Engineers as carried on by the Company at No. 5, Newcastle Street, Hulme, Manchester, together with the Letters Patent belonging to the Company and the interest of the Company (if any) in other Letters Patent.

(*b*) The FREEHOLD WORKS situate and numbered 5 in Newcastle Street, Hulme, partly Three Storeys and Cellar and partly Two Storeys and Cellar high, containing a total floor area of about 1624 square yards, having Good Lights on all four sides, Through Cartway, with Loading Stage, and two Entrances, together with the Land forming the Site thereof subject to two yearly chief rents amounting to £50 3s. 7½d.

(*c*) The PLANT AND MACHINERY includes Six Lathes, Two Milling and Two Drilling Machines, Shaper, Grinder, Hack Saw, Two Screw Presses, Hand Tools, Valuable Pipe Screwing Tackle and Outworkers' Tools, Flicker Photometer and Equipment for Testing, Three Small Electric Motors, Shafting, Steam, Gas, and Water Piping, Hot-Water Heating Apparatus, Benching, General, Private, and Drawing Office Furniture, Two Safes, Three Typewriters, and General Utensils and the Patterns now upon the Premises.

The Business, including the Goodwill and Patents (*a*), Premises (*b*), and Plant (*c*) will first be offered in one lot as a Going Concern and, if sold, the Purchaser will be required to Take Over the Stock-in-Trade, New Stores, and Work in Progress at a Valuation to be made by two Valuers in the usual way, acting for the Vendor and Purchaser respectively, with an Umpire in case of difference.
In case there is no Sale as a Going Concern, the Land and Buildings will be offered as a separate lot, at the same time and place, and the Machinery and Stock will be sold at a later date.
Further Particulars and Orders to View may be obtained from the Auctioneers, 10, Norfolk Street, from Mr. John P. Garnett, Chartered Accountant, 61, Brown Street; or from Crofton, Craven, and Co., Solicitors, 36, Brazennose Street, all in Manchester.

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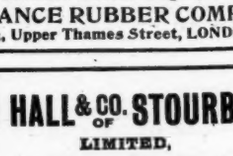

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